THE IMPACT OF DIRECT FOREIGN INVESTMENT UPON INDUSTRIAL STRUCTURE : A CASE STUDY OF THE U.K. ELECTRICAL AND INSTRUMENT ENGINEERING INDUSTRY.

A reappraisal of the model of industrial structure incorporating the impact of direct foreign investment, utilising empirical evidence from a survey of the electrical and instrument engineering industry.

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THE IMPACT OF DIRECT FOREIGN INVESTMENT UPON INDUSTRIAL STRUCTURE : A CASE-STUDY OF THE UK ELECTRICAL AND INSTRUMENT ENGINEERING INDUSTRY.

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With the development of multinational corporations, the United Kingdom has experienced increasing penetration of its economy by foreign affiliates. This is particularly noticeable in high technology industries such as Electrical and Instrument Engineering.

The thesis identifies the mechanism by which direct foreign investment can influence industrial structure in such an industry; charts the effects within the UK Electrical and Instrument Engineering Industry; and identifies the extent to which this impact varies with the nationality of the investor.

The study begins with a synthesis of the comprehensive and complex material available upon industrial/market structure and direct foreign investment.

Chapters 2 and 3 demonstrate that the structure of Electrical and Instrument Engineering has changed significantly since the inter-war years. Productive capacity has expanded faster than that of any other UK industry. Throughout the minimum-list-headings of the industry market power has become more concentrated in the hands of the largest companies. Individual affiliates now display greater product specialisation and vertical integration, whilst the level of entry barriers has risen steadily.

The model presented in chapter 3 hypothesises that direct foreign investment can be related to industrial structure in three distinct ways. Firstly, that a relationship exists between the distribution of foreign affiliates

and the structural characteristics of the industries in which they operate. Secondly, that a similar relationship exists across the minimum-list-headings of each individual industry. Thirdly, that the operating characteristics of foreign affiliates in any individual minimum-list-heading differ from those of domestic companies. The first two of these are termed the Destination impact, and the third the Behavioural impact of direct foreign investment.

The results of a survey of over 500 British and foreign owned companies, sub-divided by origin and size, suggest that foreign affiliates have contributed significantly to the changing structure of Electrical and Instrument Engineering both in their destination and behaviour.

The destination of foreign investors was significantly related to areas displaying the fastest growth of productive capacity; imperfection of competition; technologically specialised and vertically integrated operations; and high barriers to entry.

The behaviour of individual foreign affiliates was found to differ significantly from that of their UK counterparts (including affiliates of UK multinationals). Foreign owned companies exhibited high levels of sales growth and efficiency; a disproportionate impact upon the distribution of market power; greater product specialisation and levels of vertical integration; and a significant contribution to the level of entry barriers. This influence was compounded by a greater productivity and profitability in the foreign affiliate; a differing pattern of geographical location to that of UK owned establishments; and a domestic reaction by UK companies and the government to foreign penetration.

Variations within the foreign group were related to

geographical origin. The total operations of US affiliates were most significant, but investors from EEC countries displayed characteristics which varied most from those of UK companies. The study concludes by relating changes in industrial structure to the presence of foreign affiliates, and outlining the implications of further foreign involvement.

PREFACE

This study is intended to be a vehicle for the identification of a new model of industrial structure, the role of direct foreign investment in the changing structure of industries, and the presentation of new data based on a survey of over 500 companies of foreign and British ownership conducted during 1975/6. A comprehensive examination of earlier literature is contained and comparisons are drawn between the findings of these writers and the results of the survey. A case-study approach was chosen because this enhances the opportunity for an in-depth study of the relationships involved. Care must be taken, however, to ensure the results have a general applicability, and conclusions which may be atypical of other industries must be identified. Another major problem concerned the lack of data on foreign investments, in particular the merger/take-over activity of foreign parents. There is still a great deal of work to be done in this area, especially by official bodies, such as government departments and research institutions.

The reasons for selecting such a topic and the difficulties encountered, have been covered in the Introduction and more particularly in the Conclusion (see Section 7.1.), but I would like to take this opportunity of thanking those people and institutions who have helped make the final presentation of this study possible.

Firstly, Dr. Peter Buckley of Bradford Management Centre, my supervisor, without whose guidance and support

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GLOSSARY.

A.E.I.	- Associated Electrical Industries Ltd.
B.I.C.C.	- British Insulated Callender's Cables Ltd.
B.L.M.C.	- British Leyland Motor Company Ltd.
B.M.C.	- British Motor Corporation Ltd.
C.S.O.	- Central Statistical Office.
C-ratio	- Concentration Ratio.
D.F.I.	- Direct Private Foreign Investment.
E.E.C.	- European Economic Community.
E.I.	- Electrical and Instrument Engineering Industry.
E.F.T.A.	- European Free Trade Association.
F.D.T.	- Food, Drink and Tobacco Industry.
G.E.C.	- General Electric Company Ltd.
G.N.P.	- Gross National Product.
H.M.S.O.	- Her Majesty's Stationary Office.
I.B.M.	- International Business Machines Ltd.
I.C.L.	- International Computers Ltd.
I.R.C.	- Industrial Reorganisation Corporation.
I.T.T.	- International Telephone and Telegraph Ltd.
M.N.C.	- Multinational Corporation.
N.E.B.	- National Enterprise Board.
N.E.D.O.	- National Economic Development Office.
O.E.C.D.	- Organisation for Economic Cooperation and Development.
R & D.	- Research and Development.
S.I.C.	- Standard Industrial Classification.
S.T.C.	- Standard Telephones and Cables Ltd.
U.K.	- United Kingdom.
U.S.	- United States.
X^2	- Chi-squared statistical test.

CHAPTER 1.

INTRODUCTION.

One of the most remarkably successful economic phenomena of the post-war period has been the development of the multinational corporation (M.N.C.), here defined simply as a firm which owns or controls income-generating assets in more than one country. As a world force of any importance, international direct foreign investment (D.F.I.) is of comparatively recent origin, yet its value is now rising at twice the rate of world trade. This remarkable growth of the M.N.C. is having a very substantial impact, both on patterns of economic growth of individual business enterprises, and upon the national economies of investing and recipient countries.

Foreign investment is the act of establishing income earning assets in a country other than the country of ownership of the firm (or individual) carrying out the investment. This thesis is concerned only with direct foreign investment by multinational corporations rather than either public sector investment or portfolio investment, (the latter being the purchase of foreign securities which does not entail control of the enterprise whose shares are acquired), with over 90% of all foreign investment being initiated in this manner.

No economic organisation in post-industrial society has evolved so quickly and to such a degree of sophistication as the M.N.C., and whereas the development of the

trusts and cartels at the turn of the century were national in scale and controllable by national governments, the new global companies require a reassessment of the traditional government/company relationship. The first step in any effective policy relating to such investments must be the development of an understanding of the behaviour and impact of M.N.C.'s.

Industries and trades to which these companies are attracted differ from one another in many respects, in structural characteristics as well as in the economic achievements of the firms within them. Economists have long been interested in the reasoning behind the existence of such differences, as well as in the connection, if any, between particular traits and the features of economic performance. This thesis suggests that the presence of foreign affiliates and the structure and performance of their host industries are not unrelated.

1.1. Works on Direct Foreign Investment.

Many authors have called for more research into the character and behaviour of M.N.C.'s and their economic consequences. A few, notably Vaitsos (1974) and Maynard (1974), have argued that international production has posed new issues for economic analysis. Dunning (1974) has even suggested that there is a genuine need for a wholesale reappraisal of economic doctrine, given the uniqueness of the phenomena within the economic order.

Academic economists have often been accused of neglecting

real-life issues, and of concentrating upon abstract and esoteric model building. There is some truth in this contention, but the subject of the M.N.C. does offer a unique opportunity for professional economists to move into a field still relatively barren of empirical data outside the efforts of a small number of researchers.

Arguments concerning the role of private D.F.I. in international trade are of comparatively recent origin. In classical economic theory, international capital movements were generally considered to benefit both the host and investing country. In the traditional approach D.F.I. flows from countries with a lower marginal productivity of capital, to those with a higher one. The host country benefits, as well as the obvious advantages from the parent country's point of view, to the extent that the productivity of the investment and the income generated (including spinoff effects) is higher than the total amount the investor removes in repatriated earnings and interest charges.

In recent years the theory has become more and more discredited. Several works have attempted to point out the many real-world omissions of the traditional theory, and to replace it with new hypotheses and empirical data. Amongst these are major works by Singer (1950), S.H. Hymer (1960), M.C. Kemp (1962), M. Frankel (1965), G.C. Hufbauer and F.M. Adler (1968), J.H. Dunning (various publications), C. Kindleberger (various publications), M. Steuer et al (1973), F. Knickerbocker (1973), Buckley and Casson (1976), M. Brooke and L. Remmers (various publications). This list being by no means exhaustive.

Such studies, however, still concentrate heavily on the motivation of investing companies, or on cost/benefit analysis for host and parent countries. The emphasis has always tended to be on the macro approach and the implications for national policy and international trade. The major techniques can be summarised.

The standard theory of international trade, the Hecksher-Stolper-Samuelson-Ohlin approach, was not designed to account for D.F.I., and the first attempted explanation of such movements were contained in a monetary framework, in terms of international investment interest rate differentials. This first theoretical analysis of the possible effects of D.F.I. on the host country was that of MacDougall (1960). These capital movements were viewed as an addition to the capital stock of the host country, and the analytical device used was the marginal physical product of capital schedule. This suggests that foreign capital is homogeneous with host country capital and that the transferred resource consists of a single factor rather than a package of resources - both assumptions that would be refuted by modern theorists. MacDougall's study identifies areas of benefit and cost to the host country which are the taxes (benefit) and subsidies (cost) on foreign operations, and redistribution of income towards the labour force and spin-off economies and improvements in the technology of production. Later approaches have considerably expanded such cost/benefit analyses.

A major advance in the theory of D.F.I. came with the

Hymer/Kindleberger 'monopolistic advantages' approach. International investment theory was placed firmly in the realms intrinsic to industrial organisation and market structure. The theory is addressed to the question of why a foreign owned firm is able to compete with indigenous firms in the host economy, given the innate disadvantages of an international investment in a foreign market and business environment. According to Hymer and Kindleberger the foreign affiliate must posses some compensating monopolistic advantages which may be generally true of all firms of that nationality (as suggested by Aliber, 1970), or may be firm specific. Kindleberger (1969) presents a list of potential advantages including brand name exploitation, market skills, patented or otherwise restricted technological knowledge, financial economies, management skills, economies of scale and vertical integration. Hymer (1960) argues that production abroad is more profitable than other methods of market servicing because of imperfections in the markets for proprietary technological knowledge.

This approach suggests that some degree of monopolistic advantage is in existence, and such advantages can be acquired in both factor and product markets. Technological and managerial expertise have long been considered as major factors of production open to such manipulations. Movement into highly imperfect markets means that high entry barriers will have to be overcome. D.F.I. is, however, encouraged by two sets of entry barriers to the product market of the host country.

The first barrier concerns national markets. Barriers to servicing national markets through exports such as tariffs,

quotas and subsidies to domestic producers, encourage foreign production facilities in the protected market. The second barrier is a relative one, it concerns the inability in the indigenous sector to produce a competitive product. This constitutes an advantage for the M.N.C. to exploit through economies of size or integration. In these two cases the foreign parent may consider the differential barriers to the entry of foreign owned affiliates into an industry, to be less onerous than the ones facing him via other means of market servicing. (See also Buckley and Dunning 1976).

This is concerned with 'horizontal' direct investments, where the foreign firm carries out the same stage of production abroad as at home. However, 'vertical' integration as the basis for investments is also prevalent. Such investment is intended to give control over 'upstream' or 'downstream' stages of production and sale of the finished commodity. The avoidance of uncertainty (given the absence of futures markets) and the creation of barriers to entry are the major motivating forces here.

Other researchers have utilised this idea of the existence of monopolistic advantages as the basis for further research. Johnson (1970) has attempted to show that the more significant advantages have the characteristics of a 'public good', i.e. they can be exploited by an affiliate without any additional cost to the parent or any affiliate already exploiting it. For example, special knowledge or skill. Caves (1971) has argued that the most important skill is the ability to differentiate a product, whilst Hirsch (1974) emphasises the advantage offered by knowledge

obtained through R.&D. efforts. Horst (1970) has shown the relevance of 'monopolistic advantage' for an analysis of the firm's choice between exports, licensing and D.F.I. as the best method of servicing foreign markets. (Current thinking is moving more towards the view that all three need to be considered in quantifying the full impact of overseas companies on the host country economy, and this is something that must be examined later in the thesis).

However, this 'monopolistic advantages' approach faces both empirical and theoretical problems. Empirically Steuer (1973) found no relationship between the change in industrial concentration in the U.K. 1958 - 63, and the foreign proportion of sales. Globerman (1977), suggests that foreign investment is mainly in small firms operating in rapidly growing areas, a finding supported by Behrmann (1970), who attempts to show entry by foreign firms intensifying rather than reducing local competition. According to Globerman (1979) a major theoretical objection also arises. He argues that the theories which favour foreign investment being attracted to areas of high concentration and the exploitation of monopolistic advantages by such firms, completely fails to explain why foreign firms would choose to enter domestic industries directly, rather than indirectly by increasing exports or licensing to markets enjoying above average profits. Globerman suggests that the relationship between market structure and foreign investment is a weak one, and that the various competition hypotheses do not provide adequate rationale for expecting a direct relation-

ship between market structure and foreign ownership. (See Section 1.2. for further discussion).

Rival models of the investment behaviour of M.N.C.'s have been postulated, which will have important repercussions on the host economy. Barlow and Wender (1955) and Penrose (1956) have suggested a 'gambler's earnings' hypothesis to explain foreign investment behaviour. In essence, the hypothesis suggests that the M.N.C. will largely reinvest profits until a lump sum gain is transferred across to the source country. Conversely, Stevens (1967) suggests that the investment and dividend (remittance) behaviour of M.N.C.'s is governed by exactly the same considerations as any other firm and that global profit maximisation is the norm.

Aliber's theory of the M.N.C. falls within the Hymer/Kindleberger tradition, in the sense that it is orientated toward a search for an advantage of the foreign owned firm over its domestic competitors. Aliber (1970) argues that this advantage is not firm-specific, but is available to all firms based in a particular currency area.

The strength of the theory is that it predicts well the direction of the post-war expansion of M.N.C.'s, in particular, the heavy American investment in Europe in the 1950's and 1960's, and the Japanese involvement in S.E. Asia in the late 1960's and early 1970's. The resurgence of German M.N.C.'s and the recent cutback in U.S. investment can also be explained.

However, it is difficult to believe the type of myopia suggested by Aliber. Also the theory says nothing of capi-

tal flows within currency areas. Neither can it account for cross-investment between currency areas, i.e. U.S. investment in European countries offset by a return flow. There is also a weakness in explaining why green field ventures are often preferred, when the parent can profit from investor myopia simply by taking over a going concern. The theory fails to explain why holding companies have not been established purely to capitalise on investor myopia. Some may have been, under the cover of legitimate operations, but many opportunities have certainly been ignored.

It has been suggested that D.F.I. is the result of a conscious effort by management to diversify the firm's activities. Horizontal, vertical and conglomerate diversification could all be seen as aspects of this activity.

Caves (1971) sees diversification as a means of exploiting a general ability of the firm to differentiate a product. The same effect can also be seen if a firm possesses excess resource capacity, and the activities require a deployment of such resources over a wider range of products and/or markets. If the firm's domestic scale is limited by market or the constraints of competition, then new products and markets must be sought. This may be of an international nature.

The product-cycle theory of Vernon (1966) is a further development. This hypothesis suggests that the location behaviour of the M.N.C. will vary according to the development of the product and the technology under which it is produced. Vernon suggests that the pressure to innovate is the greatest in the U.S.A. for two major reasons. Firstly,

the very high labour costs induce entrepreneurs to substitute capital intensive techniques. Secondly, because of high income levels, new wants appear first in the U.S.A. and because the transmission of such wants to entrepreneurs is a function of geographical proximity, these demands are first met by U.S. firms. Consequently U.S. firms have the first opportunity to create the new products. However, as production becomes more standardised and techniques more stable, the producers are attracted by emerging markets elsewhere and D.F.I. occurs to exploit the cost and demand stimulating advantages of localised production. In the 'mature stage', technology is stabilised and the main determinant of location becomes labour cost, the product now being more labour intensive than in the earlier stages. Investments are therefore located where low labour costs can be attained. This could make for a mobility and flexibility (footloose) quality of production, with each stage being related to a preferred site, each of which may be different.

The Vernon approach provides a useful framework. Attention is directed to the existence and means of exploiting monopolistic advantages, and is related to the industrial structure of the host country. In particular the fields of technological gain and loss (diffusion and costs), external costs and benefits, losses from monopolistic exploitation, the effects on the internal and external distribution of income, and the efficiency gains, with effects of managerial and organisational improvements, are highlighted.

Support for such a theory is evident in the writings of other academics. Hufbauer (1970) and Wells (1972) would appear to have successfully related the exports of U.S. industries to the degree of product innovation and non-standardisation. The suggestion that the post-war acceleration of U.S. dominance in the level of world D.F.I. is related to either a shorter lead time between innovation and standardisation, or to increasing consumer preference for the new products of such processes is endorsed by Servan-Schreiber (1968) and Galbraith (1967) respectively. Unfortunately, although much can be said in support of these contributions, both are lacking in hard empirical evidence.

There are many limitations, however, with Vernon's approach. Firstly it does not account for the increasing percentage of D.F.I. which originates for non-export substituting reasons. As this is of comparatively recent origin, Buckley and Casson (1976) have suggested that this might simply be seen as a limiting factor, in which the lead time tends to zero, however they also point out that this would still not explain the tendency for non-standardised products to be produced abroad, and for the existence of market orientated product differentiation.

It appears that whilst the product cycle is an accurate description of the pre-war (and to some extent the early post-war) situation, recent trends have outdated it. In particular the modern highly organised process of product development and innovation, so that products are planned and differentiated at the outset to uniquely suit individual market conditions. Buckley and Casson (1976) also highlight two methodological objections to the theory.

Firstly, although the theory claims dynamism, in the sense that time series is involved, it is in fact only programmic. It predicts the sequence of events, but can say nothing about the speed of events, or inherent time-lags. This means that by adjusting the time period involved in each phase of the model, the theory can be fitted to a range of data. Secondly, the theory considers three decisions, namely those concerned with how much to invest in product development, how to service the market abroad, and how to compete with overseas firms. Each is treated as an autonomous decision, made at quite different stages of the cycle. A rational decision-taker cannot isolate such decisions, they are interdependent and as such must be considered simultaneously.

Later writings by Vernon (1971; 1974) have substantially modified his theory. Emphasis has been shifted to oligop-olistic behaviour, and the desire by firms to maintain an oligopolistic market structure by erecting barriers to entry. The first stage, 'innovation-based oligopoly' remains much the same as in the earlier versions, except that on the supply side, both labour and land saving (Western Europe) and material saving (Japanese) innovations are recognised.

The second stage, 'mature oligopoly' has changed. Here economies of scale in production, marketing, and research constitute effective entry barriers. Behind these rival firms each nullify strategies initiated by others. The ultimate oligopolistic sanction is the price war, and to strengthen their position in this area companies seek to

extend their position into the rival's market to nullify the tariff barriers to export competition. Stability is only achieved once all firms produce in all major markets.

The final stage, 'senescent oligopoly', exists once economies of scale are no longer sufficient to deter potential entrants. Competition becomes less perfect.

Empirical support for this later version is presented by Knickerbocker (1973). According to Knickerbocker the timing of foreign investment is one of oligopolistic reaction. He argues that the optimal strategy for firms engaged in areas of oligopolistic competition is to match their rivals move for move. The 'bunching' of D.F.I. movements are measured as proof of this. However, the objectives of the firm are never clearly stated, and it is never shown why such oligopolistic reaction is the optimal strategy. Buckley and Casson (1976) have suggested that if market leadership is the reason for such bunching, then a completely randomised investment pattern is the best strategy to obtain a market lead. The theory seems to be saying that followers move irrespective of the potential profitability of the new market, i.e. if the market leader is wrong then everyone is wrong, so if you are prepared to move your company first into any new area then you will obtain a market leader position. Also we are given little insight into the motivation behind the market leaders' decisions to invest beyond the random hypothesis.

For Aharoni (1966) the timing of D.F.I. depends upon the chance stimuli which exist in the business environment, and the method by which these are converted into investment decisions. These stimuli may be of internal or external

origin, and decisions are consistent with profit maximisation under conditions of uncertainty. Some caution does have to be expressed at Aharoni's sample upon which the data is presented. There is a possibility that U.S. investors in Isreal are atypical, and that a wider geographically based sample would have demonstrated a different result. Generally Aharoni's firms were also, genetically speaking, young in their multinational life, and it is possible that the data may have been different if older, more established companies had been surveyed.

Buckley and Casson (1976) have developed a theory of multinationality generated by the internalisation of markets, and predict an optimal degree of internalisation is possible for the individual firm.

The main factors are industry-specific, in particular (i) the significance of knowledge flows and the difficulties of licensing knowledge, and (ii) the significance of time lags in the production process will lead to a pressure for the vertical integration of markets within the corporation. Secondly the theory suggests that, prima facia, this internalisation of markets leads to the internationalisation of the firm via the geographical spread of the markets involved.

This theory has the added advantage of being predictively dynamic. It explains the growth and location policies of the firm as functions of key exogenous variables, and predicts at what rate and in which direction the firm will evolve.

One final approach to D.F.I. is Corden's 'enclave';

where the foreign firms are regarded as constituting an 'enclave' or separate economy within the host country economy. Corden (1967 and 1974) suggests that the vital relationships are those between the host economy and the 'enclave'. The M.N.C./rest of the world relations are considered of only secondary importance. This would enable the analyst to treat the costs and benefits of D.F.I. in a traditional international trade approach. Whilst the author cannot fully agree that the parent country/company and subsidiary/host country relationships can be so readily ignored, it is useful to see that here is a writer identifying the problem of foreign affiliate activity as one related to their competitive actions within the host country's economy on a day to day operating level, rather than being over concerned with the rationale of the original investment decision.

All of these works can be subdivided into two basic approaches. One, the empirical, seeks to deduce from statistical analysis of data what effect D.F.I. has had. Also within the empirical mould can be included the questionnaire and interview approach, which seeks to discover the motivation of the corporations in deciding to invest abroad. The other major approach is that of constructing an idealised firm, and examining, on the basis of various possible sets of assumptions, how it would behave to maximise some comp-any objective. From this may be deduced what effects would occur in the real world.

Both suffer from serious defects. The first from the weaknesses in the data, lack of data and inadequate proxy

variables. The other from a lack of realism in the basic assumptions.

Despite the acknowledged shortcomings of these approaches the only evidence available stems from one or other of them. Both give insights and indicate the probable effects upon countries and companies of the development of the M.N.C..

This study, along with the above, suffers particularly from the lack of published data in the field, and the lack of standardised commitment to data publication by all affiliated companies operating within the U.K.. Therefore, this study relies heavily upon questionnaire material with its inherent pitfalls, and the lack of comparative coverage can only be expected given the lack of time and physical resources available to the individual as opposed to national agencies.

It has made a useful starting point to consider the internal decisions behind the D.F.I. flow. Despite the many works presented above, the situation is still complex, and most economists would agree that the answers to many of the questions posed on the subject are still not available.

Native firms in host countries are likely to possess many advantages not immediately accessible to the foreign entrant; familiarity with the law and customs of the country, knowledge of local markets for factors and products, knowledge of local language, experience with labour practices and union policies, better relationships with political, legal, financial and social institutions, and proximity to head office are just a few. To offset these the foreign

affiliate must possess powerful counterbalancing advantages, and we have seen many areas where these might arise.

In a world characterised by laissez faire, with perfectly competitive markets for factors and finished products, there would be no incentive for the existence of D.F.I.. Trade barriers, and transport costs would simply on their own not be justification for the establishment of fully controlled operating affiliates in the host country. Some form of imperfect competitive advantage must exist for D.F.I. to take place.

This advantage must also be of a type that is not profitably transmitted by direct sale or license, but must be most profitable (given the higher risk, then greatly more profitable) when exploited via the medium of D.F.I.. The fact that the internationalisation of business has already proceeded so very far, and is continuing to do so at an equally rapid pace, suggests that firms which invest in overseas production facilities are, (i) not rational, or (ii) are maximising some objective function other than profits, or (iii) are exploiting non-marketable specific advantages possessed by the parent firm.

This study would suggest that the last named is the case, and that the exploitation of such advantages will have an impact upon the industrial structure of the host economy and the industries which comprise it.

The impact of such investment upon the host economy is a subject of great debate amongst economists. There is no reason to believe at this stage that this impact is necessarily either beneficial or harmful; for example competition

may be reduced in some areas by the entry of foreign giants, but in other areas the local firms may receive a salutary shock from the arrival of more efficient foreign affiliates. Writers are divided upon the subject, and even disagree over their empirical findings. It is not our intention to draw any such conclusions in this study, but simply to present behavioural characteristics only in terms of their impact upon industrial structure. For example, certain policy decisions aimed at controlling D.F.I. will have an impact on structure and are thus of relevance to this study, but in that context only, not in terms of their intended political, moral or social objectives.

Servan-Schreiber (1968) advocates measures to create giant European companies as the answer to foreign penetration. Meanwhile, Hymer and Rowthorn (1970) make the point that the U.S. international corporations do not grow faster than their European or Japanese rivals and that there appears to be if anything a negative relationship between size and growth. Imitation by indigenous firms could lead to more monopoly through defensive combination of firms, and so to slower growth and less efficient production. This evidence is contentious, however, and if we take the U.S. firms resident in the U.K. and the E.E.C. in general, then they, on average, outperform their indigenous competitors (Dunning 1970). Therefore imitation by U.K. or European firms would not of necessity be a bad thing for the domestic economies.

Even if it is agreed that the entry of foreign firms stimulates the increase of concentration in industry, it

is by no means clear that this is necessarily adverse in its effects on efficiency. In so much as it occurs in areas where economies of scale exist, and are important in lowering unit costs of output, efficiency may benefit. Export creation and import substitution are further benefits for the host economy, and the vertical integration which is common in many international corporations can also bring benefits by internalising risk and so lowering costs. However, these intra-firm sales guarantee in no way that the prices charged will reflect market prices. This affects both foreign exchange earnings and receipts from corporation taxes. It also enables the foreign subsidiary to exploit such low cost advantages, along with the managerial and technological expertise available from the parent, plus the sources of finance within the global corporation to compete on advantageous terms with his domestic counterparts.

This thesis, therefore, would suggest that such an impact requires a wider definition than simply that of market structure as much of the effect transcends the concept. At a later stage, therefore, the idea of industrial structure will be introduced as related to individual industries rather than meaning the overall balance between industries within the economy.

Before this step is taken, however, an analysis should be made of writers who have presented theoretical and empirical evidence on the relationship between market structure and the presence of D.F.I..

1.2. Works on Market/Industrial Structure.

It has long been recognised that both the efficiency of resource allocation and the distribution of economic welfare are strongly influenced by the structure of the markets in which firms buy and sell goods and services, and their conduct and performance within these markets. Up to now, however, most of the standard texts and readings on the subject have confined their analysis to the behaviour of firms in the context of a closed economy and have taken virtually no account of the phenomenon of international production. (See, for example, Scherer 1965 and 1970; Bain 1968; Yamey 1973). Since there is evidence that they do behave differently to their domestic counterparts then this omission is surprising. (See Steuer 1973; Dunning 1973b; Sciberras 1977 and Globerman 1979).

Dunning has already suggested that the conditions under which firms organise themselves to buy and sell goods and services, inter alia, the number and size distribution of the firms and the extent to which they are horizontally or vertically integrated, the conditions of entry facing potential buyers and sellers, the technology of production and marketing, the characteristics and diversity of the products supplied, and the spatial deployments of markets and production units,are related. By affecting the distribution of the value added from affiliates between host and parent countries, M.N.C.'s may also influence the above factors and the host country's attitude towards them. Both can better be exploited by the affiliate of an M.N.C. because of the wider options open to it.

Dunning also suggests that structure emerging from the operations of foreign affiliates, may better conform to the principle of international division of labour than that of the national markets. The exceptions being where (i) prices in particular markets do not reflect world prices, (Little and Mirrlees, 1969), (ii) where there is imperfect competition between M.N.C.'s, or (iii) where there are restrictions on the transference of certain assets or property, e.g. trademarks.

If the behaviour is related towards the goals of the parent company, then this may lead to a different level and composition of products and/or processes, and a different distribution of the benefits of such activities, than those which would arise from multi-plant national firms, or international trading activities.

Most examinations of the characteristics of M.N.C.'s today rely heavily upon U.S. data. It is all too easy to examine such affiliates and transfer the norms of activity to the remainder of the international business world. The industrial and geographical distribution, and success of foreign owned income generating assets in host countries is in fact a reflection of distinct advantages of production via D.F.I. which varies from source country to source country. In this study affiliates of all major geographical sources of investment will be examined.

An analysis of the traditional composition of the stock of D.F.I. of the leading market economies, as set out in Table 1.1., suggests certain important differences.

TABLE 1.1.

Percentage distribution of Foreign Subsidiaries by industry group for selected countries in 1971, showing industries classified by research intensity. (U.S. figures refer to 1968)

Industry.	West Germany	U.S.	U.K.	Japan	Holland
	Nationality of Parent				
Research Intensive:					
Precision Goods	3.3	2.0	0.6	0.2	2.9
Transport Equipment	5.7	6.0	4.7	8.4	0.2
Non-Electrical Mach.	12.0	14.0	8.1	14.0	5.6
Electrical Machinery	18.0	9.6	11.0	17.0	34.0
Chemicals	46.0	29.0	21.0	8.0	32.0
Rubber	2.1	3.0	2.4	2.7	0.2
Petroleum	1.2	5.5	3.4	0.2	10.0
Total %.	88.3	69.1	51.2	50.5	84.9
Non-Research Intensive:					
Food	0.3	14.0	25.0	5.3	0.5
Primary Metals	6.6	3.0	8.4	9.4	1.7
Textiles and Clothing	1.1	2.7	4.1	28.0	3.2
Wood,paper,furniture	1.8	5.3	5.6	2.5	0.7
Other	2.4	6.2	5.2	4.1	8.0
Total No. of Subsidiaries.	666	[illegible]	2160	438	410

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Buckley and Casson (1976)- The Future of the Multinational Enterprise. Macmillan.

Within manufacturing industries, for example, Japanese investment is far more orientated towards traditional sectors than that of the U.S. or the U.K.. Germany, on the other hand, would seem to have substantial comparative advantage in chemicals and electrical products. There may also be differences in the motivation of firms and the market structure of the investing countries. Therefore this study considers it essential that any meaningful conclusions concerning the impact of D.F.I. on certain aspects of host economies, must incorporate data on all sources of D.F.I..

A great deal can be learnt, however, from study of the U.S. pattern of investment, and such evidence is not without overall empirical inference given the dominance of this source of D.F.I. within the total world flows of such investment. Several authors have also suggested that subsidiaries of U.S. parents can be seen to possess operating advantages over and above their counterparts and that such affiliates are located in industries which display a consistent set of structural characteristics. Various theories have been propounded (often with empirical support) to explain why such a relationship should exist.

It was shown earlier that many writers have suggested that foreign investment is motivated by the ability to exploit a 'monopolistic advantage'. An alternative hypothesis is that the competitive advantage enjoyed by the foreign firm enables entry to concentrated industries more easily than the domestic firm (Caves 1971; supported empirically by Gorecki 1976).

A third explanation, presented by Williamson (1975),

is that the major advantage of undertaking an internalisation of firm trading is that it permits a reduction of uncertainty within the firm's environment. However, such arguments have been used to understand the motivation of vertical direct investments (Caves 1971), but not explicitly as a potential motive for horizontal direct investments.

This argument would lead us to believe that the influence of market structure upon foreign investment is concerned with the ability of foreign firms to better exploit competitive advantages in oligopolistic markets by the use of overseas production facilities. i.e. that an industry's market structure conditions the way in which foreign firms exploit their competitive advantage over domestic firms.

Globerman (1979), however, argues that evidence for such a relationship is weak. Empirical findings by several authors support this.

Steuer (1973) could only present low correlation coefficients ranging from 0.12 - 0.24 when examining the relationship between 5-firm concentration ratios and foreign activity, (measured as the percentage of total sales accounted for by the largest foreign producers).

Dunning (1973b) analysed the distribution of sales of U.S. affiliates in 40 sectors of the U.K. industry for 1970-1. These companies were concentrated in industries which were only slightly more oligopolistic than the average for the sample.

Caves (1974) in a study of 52 U.K. manufacturing sectors indicated that the average share of sales accounted

for by foreign owned firms in consumer goods industries is positively and significantly related to a measure of scale economies. However, no significant relationship between the variables was uncovered for producer goods industries.

Baumann (1975) suggests that there is a distinct relationship between foreign investment and market characteristics, whilst Rosenbluth (1970) says that there is not. Meanwhile Globerman (1979) concludes that the bulk of evidence available for the U.K. manufacturing industry offers only weak empirical support for the hypothesis that market structure can be related to foreign ownership levels. Several writers would argue that Globerman is understating the case and that a significant relationship does indeed exist.

Vaupel (1971) relates U.S. penetration and the degree of technological input within the industries involved, whilst Johns (1967) and Vernon (1971) provide evidence to show that U.S. affiliates are larger on average than their domestic counterparts and produce under conditions of imperfect oligopoly. In general foreign affiliates tend to be more capital intensive, pay higher wages and record above average productivity, growth and export performances than their non-multinational competitors, (Horst 1972). Meanwhile Adam (1971) identifies a second sort of affiliate, which uses the local production overseas to service third markets, usually to exploit lower labour costs.

All of this suggests that affiliates of foreign multinationals exhibit structural traits which may be either alien to the host country industry, or may help

exaggerate trends already present.

Turning to the structure of markets within which such affiliates operate provides further evidence that this may be the case. Table 1.2. illustrates the participation ratios* of U.S. affiliates in selected branches of manufacturing industries in five countries. This and other data for the U.K. (Dunning 1973b) reveals that U.S. D.F.I. in the U.K. is markedly higher than average in the technology industries, in industries where barriers to entry of indigenous firms are most pronounced, and in industries producing products with high income-elasticity of demand. D.F.I. also seems related to areas of oligopolistic competition and the availability of oligopolistic combination and agreement between foreign and indigenous firms.

Caves (1974) suggets that we can integrate the M.N.C. into the theory of industrial organisation. All that has to be done is either to jettison the concept of national boundaries as a limiting factor to the expansion of domestic companies, or to accept the national market as the basic unit of analysis and modify the concepts and hypotheses traditionally used to analyse them, to allow for the presence of M.N.C.'s. He states a preference for the latter method. Bain's general approach of analysing conduct, behaviour and performance is suggested, as it is in all such recent studies, and this has possibly become something of a straight-jacket for most researchers in the field.

Cave's hypothesis that the performance of indigenous and foreign owned firms is related to a series of structural

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* Defined as the share of total output.

TABLE 1.2.

Percentage of output accounted for by 300 large U.S.-based M.N.C.'s in the manufacturing industries of five selected countries in 1970.

	Canada	U.K.	Bel-Lux.	France	WG.
Food	26*	10*	5	3	4*
Paper	39	5*	19*	8*	2
Chemicals	85	21*	48*	12*	7*
Rubber	98	31*	82	6	11
Metals	29	10	6*	2	7*
Non-Electrical machinery	80*	21*	41*	14*	11*
Electrical machinery	82	18*	43*	8*	6*
Transport Equipment	90*	21*	18	8	25*
Textiles	16*	1	10*	0	1
Lumber, wood, furniture	50*	1	0	0	1*
Printing & publishing	12*	2*	1	1	1*
Stone, clay & Glass	32*	6*	6*	9*	4*
Instruments	90*	56*	45*	20*	25*
Other Manufacturing.	30*	30*	0	1	6
All Manufacturing	52*	16*	16*	6*	8*

Note: An asterisk indicates that M.N.C. penetration rose in the period 1966-70.

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Buckley and Casson (1976) - The Future of the Multinational Enterprise. Macmillan.

characteristics is the starting point of this study. However, Cave's analysis dwells upon the concept of market structure and the degree of competition. This study would suggest that this should be treated from a wider angle.

Knickerbocker (1973) also has something to say about the effects of D.F.I. on the industrial structure of the host country, and believes that the level of concentration, diversification, integration, and profitability, all have an effect, and are affected by, the entry of new foreign affiliates into the industry.

K.P.D. Ingham (1975) amongst others, has explored the implications for location and regional policy of D.F.I., and concludes that foreign subsidiaries have a role to play in shaping the distribution of industrial establishments throughout the regions of the U.K..

Steuer (1973) has suggested that D.F.I. is an oligopolistic phenomenon, equally capable of increasing the level of competition as reducing it, and previous writers are fairly evenly split as to which of these two alternatives they support.

Brooke and Remmers (1970) lend support to the argument that foreign affiliates outperform their domestic counterparts and move into the areas of greatest potential.

All of this suggests a direct relationship between D.F.I. presence and market structure as variously defined. For many writers market structure could be measured traditionally by the degree of seller concentration, the extent of product differentiation, and the nature of entry conditions. Scherer (1970) also considers the extent of vertical integration and product diversification as worthy of detailed consideration,

whilst Low (1970) adds the concept of economies of scale.

Others have discussed the changing industrial structure, by which they meant the relative contributions and development of the industries comprising the U.K. economy as a whole.

A third group of writers have used the terms interchangeably, and often refer to one when really alluding to the other, given the traditional definitions of the two concepts. (For example George 1967, 1968, 1974; Scherer 1965, 1970)

1.3. The Aims and Contributions of the Study.

In that past development is essential to any meaningful understanding of the present profile of an industry and its future potential; as most companies operate in many markets, each with a different industrial definition and market structure; and the footloose quality which surrounds the location decision of most multinational affiliates, it was considered that the two terms discussed above are both inadequate to fully explain the impact of D.F.I. upon the operating environment of the host country industry.

Many authors have analysed the changing structure of the U.K. economy, and the industries which comprise it. For the most part they have attempted to 'explain' various structural features, seeking to identify factors and influences which operate in shaping industrial structure, and circumstances under which changes in structure may occur.

The emphasis has been either primarily on the explanation of differences among the industries rather than upon

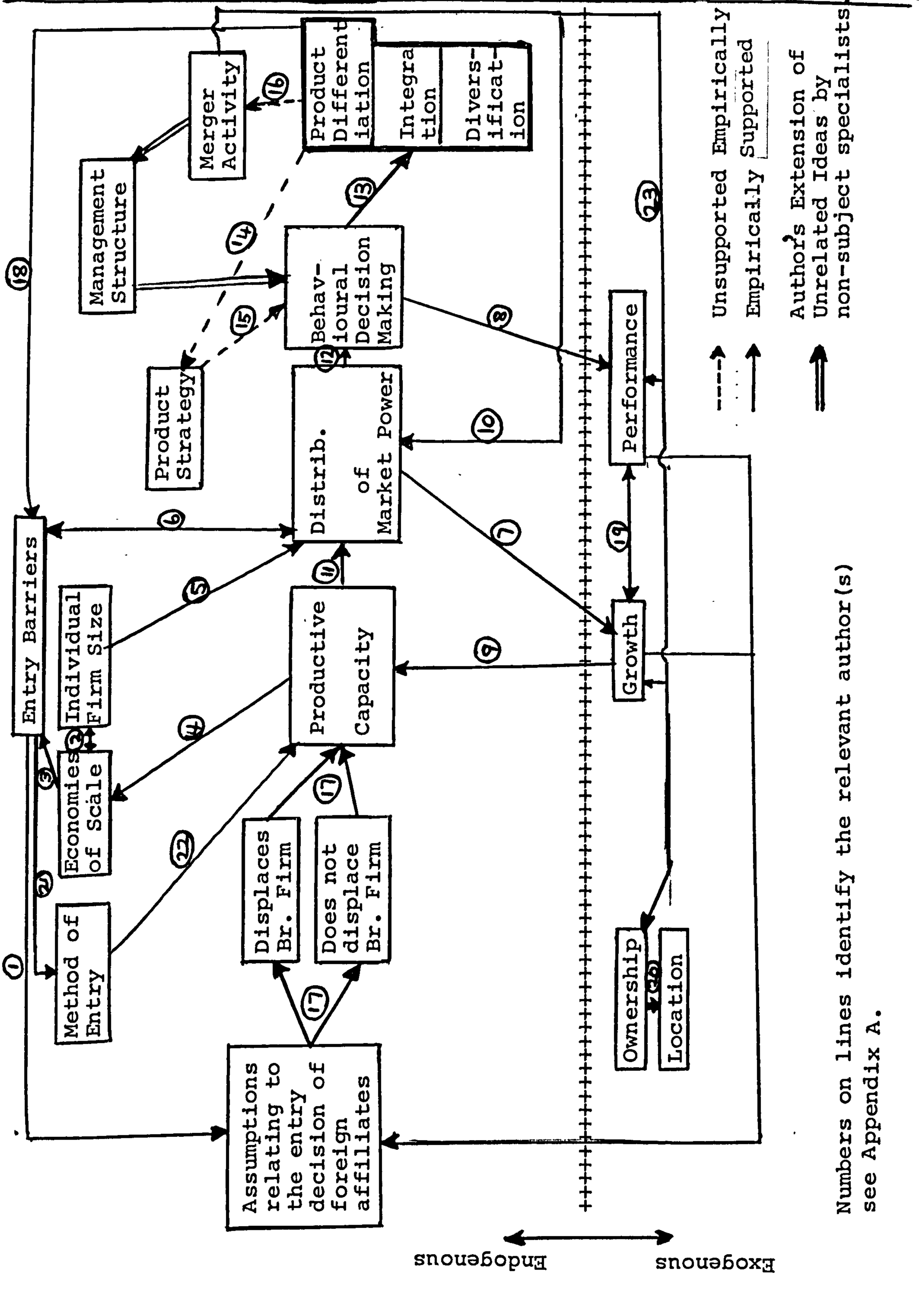
a detailed examination of any one industry's structure, or detailed empirical analysis of isolated structural characteristics, usually with complete lack of any general framework or reference to overall structure.

A wealth of theoretical and empirical material exists on the subject of market and industrial structure, much of which is confusing and often contradictory. The following logic diagram (Figure 1.1.) is an attempt to synthesize such data into a series of meaningful relationships. (The numbers on the arrows refer to a list of authors whose works are included - see Appendix A). A confused picture is still evident. The first contribution of this study, therefore, is a reappraisal of this unsatisfactory situation, and a simpler model of industrial structure is constructed. During this study the term industrial structure will be taken to refer to the model as constructed in Chapter 3. We will define industrial structure as consisting of four areas of measurement namely, the size of productive capacity, the distribution of market power, the profile of the product and process structure, and the height and composition of entry barriers.

A series of secondary variables are also identified which have an impact on the model. For example, the efficiency, location and domestic reaction to foreign affiliates, of the industry's firms are all likely to have an effect upon industrial structure. A distinction between these exogenous and the earlier endogenous variables is drawn by the immediacy of the impact. (For example, if productive

FIGURE 1.1.

Schematic diagram of previous works on Industrial and Market Structure.



capacity increases then structure is immediately affected, and will have implications for the three other endogenous variables. If the pattern of industrial location or efficiency altered, however, then a secondary impact is possible upon the prevailing industrial structure, but the effect is not as immediate.

The second major contribution of the thesis concerns the way in which foreign affiliates have an effect upon the industrial structure of an industry. The traditional direction of interest is reversed. Most writers have been concerned with the attraction of various structures for foreign investors as a motivating factor. Here the study attempts to analyse the influence of foreign investors upon the existing structure. Whilst it is possible to observe only the aggregate changes in structure and associate these in some way with the presence of foreign affiliates, it is possible to identify three analytical stages at which the impact might be made.

In this study the hypothesis that D.F.I. has a triple impact is tested. These three levels of impact have been designated the Economy-, Industry-, and Firm- level effects of foreign affiliate activity. The first two of these comprise what has been termed a Destination impact, whilst the latter is a Behavioural impact. It is hypothesised that the distribution of D.F.I. throughout the U.K. economy can distort the pattern of resource allocation, influencing growth and performance within the individual industries. Also that a pressure for structural change

stems from the changing pattern of development of the minimum-list-headings of an industrial sector, and that a differential distribution of D.F.I. activity could have an influence upon such development. These comprise the impact upon structure of the final destination of foreign investment. Finally there exists a basic micro imbalance of operating performance and behavioural reactions to competition between companies even within the same minimum-list-heading. This face-to-face performance of the individual companies, and the interaction of indigenous and foreign owned firms, will be an important determinant of the final structure of any industry. This is termed the Behavioural impact.

In conclusion, therefore, the industrial destination of the affiliate causes a pressure for change in the structure of the economy, but this also affects the individual industries (Economy effect). Also the distribution of affiliates within the minimum-list-headings of an industry will initiate a second source of pressure (Industry effect). Finally the individual operating performance of the affiliate will affect the structure of the industry in which it is located (Firm effect), (See section 3.1.3.).

An attempt is made to identify these different stages of effects and demonstrate how each makes a contribution to the overall noted changes. It is hoped that in future research a growing sophistication in analytical techniques and the willingness of companies to divulge the necessary information will enable a more

precise role of these three stages to be quantified.

The third contribution is in presenting new data by which the model can be tested, and a survey of over 500 foreign and domestic companies operating in the U.K. was carried out during the period 1975-76.

The framework of analysis adopted is that of the industry study. Easily spurned by more sophisticated researchers, the detailed analysis of the structure and behaviour of individual national industries under the impact of D.F.I. has nonetheless made (and will continue to make), an invaluable contribution to our understanding of how the elements of industry and market structure interact with each other; how special or rare traits of structure can affect performance in particular industries; and what significance we can give to the various patterns of conduct that emerge when foreign affiliates are present.

It is not likely that the long-run effects of the M.N.C. on the operating characteristics of the individual industries which comprise the economy will be fully appreciated without intensive studies of specialised data on a longitudinal basis.

The U.K. Electrical and Instrument Engineering Industry (E.I.) is used as the vehicle for the study. This sector has experienced a rapidly changing environment during the twentieth century, and incorporates the high levels of technological development and managerial expertise preferred by the foreign investor. Many earlier writers (see sections 1.1 and 1.2.) have suggested that such

industries are attractive to overseas multinationals and with this sector's growing importance to the U.K. economy, and the heavy rationalisation influenced by both private and public sector activity (see chapter 2), the E.I. shows great promise as a source of D.F.I. impact upon industrial structure.

To this end, Chapter 2 traces the development of the E.I. since approximately 1935, when nationally aggregated data first appears. The E.I. has displayed a remarkable growth of importance within the U.K. economy, and consequently the profile of the industry has changed considerably during the period. The situation is examined in terms of general performance and profitability, and data presented on the principal market leaders and their product range. The three major sub-divisions of the E.I. namely, electrical engineering, instrument engineering, and electronics, are closely scrutinised and the growing dominance of the latter, with its related technological and capital based is discussed. Consequently the shifting relationship between the minimum-list-headings, and their relative importance to the overall performance is evaluated. The industry is placed in the context of British industry as a whole, and the world scene in electrical and instrument engineering.

Chapter 3 turns to the concept of industrial structure. A definitive model is constructed, and the underlying hypotheses introduced. The changing structure of the industry is charted, and a proposition made that three levels of pressure for structural change exist, namely at an economy, industry, and firm level, each of which can be

influenced by the presence of foreign investors. Finally it is hypothesised that the overall impact can be explained by a series of primary behavioural and secondary behavioural variables. The methodology and survey data is introduced.

The fourth chapter focuses attention on the economy and industry level pressures for structural change, i.e. the effects of D.F.I. activity in the different industries of the U.K., and secondly its differential effect in the various minimum-list-headings of the E.I.. The patterns of investment are analysed, subdivided by geographical origin, amount (stock and annual flow), direction, date, method of entry, ownership structures, and rates of return. The pattern of activity in the E.I. is compared with the pertaining structural characteristics, and conclusions are drawn concerning the possible structural implications.

Chapters 5 and 6 examine the behavioural (firm level) impact of D.F.I. presence, and deal with the primary and secondary variables respectively. Data used is based largely upon a survey (detailed in Chapter 3), and subdivided into six ownership groups, namely, affiliates of U.S.;E.E.C.; and Other country parents; and affiliates of large multinational U.K. parents; smaller domestic U.K. parents; and Independent U.K. firms. An attempt is made to assess the relative contributions of each of these groups to the final structure, (an approach adopted recently by Sciberras (1979) with his 'big' and 'little' league firms).

Chapter 5 concerns itself with data on the impact of individual firm activity on the primary variables, the size of productive capacity, the distribution of market power,

the product and process structure, and entry barriers. Chapter 6 presents data on a series of secondary variables which nevertheless have an important role to play in determining the final structure if only indirectly. The data includes efficiency, regional location, productivity and the domestic reaction.

Finally conclusions are drawn in Chapter 7 as to the total impact of foreign subsidiaries and indigenous firms on the industrial structure. Possible future developments are discussed, and possible policy implications highlighted.

CHAPTER 2.

A PROFILE OF THE U.K. ELECTRICAL INSTRUMENT AND ENGINEERING INDUSTRY.

Having defined the terms of reference and modus operandi in the previous chapter, the first major task is to construct a profile of the E.I..

This chapter has a two fold purpose. Firstly to monitor the changing nature of the E.I. and its role within the U.K. economy; also to examine the development of the minimum-list-headings which comprise the industry. The E.I. is contrasted with the remainder of both the domestic and international economies to determine the industry's contribution to the U.K. industrial scene, and thereby demonstrate the relative importance of any structural modifications resulting from the presence of D.F.I. within it. Secondly, the industry's major companies are introduced, and their role in the rationalisation of the E.I. in the past two decades is discussed (see section 2.4.).

After an initial look at the development of the industry since the first world war, the chapter looks at the present day standing of the E.I. in the domestic and world market. Subsequently the analysis moves on to an examination of the minimum-list-headings within the industry to determine their relative importance to overall performance. Throughout, the discussion includes a micro level approach and highlights the role of the individual company, seeking to familiarise the reader

with the larger firms involved. Finally the study is concerned with the rationalisation of the E.I. during the last twenty years, pinpointing the relationship between such changes and the performance and efficiency of the industry's larger companies.

2.1. The Electrical and Instrument Engineering Industry.

So far reference has been made to the "Electrical and Instrument Engineering Industry", and its existence justified by further reference to the S.I.C. Classification of 1968 (Appendix B). However, this is not a cohesive unit, and really consists of three major sub-divisions; Electrical Engineering, Instrument Engineering and Electronics.

Even these three headings consist of several S.I.C. minimum-list-specialisms, and the production and marketing of such equipment spreads across many of the major industrial sectors. A large number of firms within this classification are little more than component assemblers or research specialists, whilst others range from marketing organisations through to producers of heavy electrical machinery bordering closely on the Mechanical Engineering sector.

The study will nevertheless utilise the 1968 classification, the industrial spread of activities being covered to some extent by the index of diversification constructed in Chapter 3.

The E.I. consists of the S.I.C. orders VIII and IX, minimum-list-headings 351-369, i.e. Photographic and Docu-

ment Copying Equipment through to Miscellaneous Electrical Goods. This industry, often compared favourably with the older, declining industries of the U.K. and described as a growth sector of the economy, is very largely an intermediate one, the products of which generally only appear to the working public as parts of larger, more complex, capital goods. Often the manufacturer is nothing more than an assembler of the necessary components. These components, whether they be single transistors or complex process-control lines, are put to use as part of a product which, in many cases, is only of indirect sale to the general public (e.g. Power Machine Tools, Insulated Wires and Cables, or Telephone and Telegraphic Apparatus). Sales of final stage Domestic Electrical Appliances, along with similar Miscellaneous Consumer Products such as Batteries, Lighting Equipment, and Watches and Clocks, accounted for only 12.1% of total sales value in 1976, and this represents a declining proportion, the figure having been 22% in the early 1960's (Table 2.1.). This would suggest that the real consumer market bonuses stem from the application downstream of various components, within the necessary electrical capital goods required at the intermediary production level of utility products.

2.2. The Development of the Industry from 1920 to 1976.

Here, and in the subsequent sections of this chapter, the origins and development of the present day composition of the E.I. are examined. Neither the reasoning behind

TABLE 2.1.

The Percentage of Sales accounted for by the Minimum List Headings of the E.T. : 1935, 1948, 1963 and 1976.

Sector Heading.	(%) 1935	(%) 1948	(%) 1963	(%) 1976
Instruments (excl. watches & clocks)	8.7	9.0	11.7	12.9
Watches and Clocks	1.1	1.2	0.8	0.9
Electrical Machinery	34.4	40.7	19.6	16.5
Wires and Cables	16.8	16.7	10.2	8.4
Telephone and Telegraphic Apparatus			6.9	8.7
Radio and other Electrical Apparatus	32.2	26.0	25.8	10.3
Broadcasting and Sound Reproducing Equipment				8.7
Electrical Computers				6.0(a)
Radio, Radar & Electrical Capital Goods				10.7
Domestic Electrical Equipment			8.5	7.0
Miscellaneous Electrical Goods	6.8	6.4	16.5	9.9
of which:-				
Consumer Products	N/A	N/A	12.8	4.2
Totals	100	100	100	100

(a) 1975 figures.

Source:- Calculated from Report on the Census of Production (various issues) H.M.S.O.

management decisions having influence on such developments, nor the differential role of foreign affiliates, are introduced at this stage. Individual companies are treated insofar as they are part of the U.K. domestic scene, and no attempt is made to attribute their activities to their respective ownership.

2.2.1. 1920-1948:

This study is mainly concerned with the E.I. since the second world war, and more specifically, with its accelerated development from the late 1950's to the present day. A short thumb-nail sketch of the industry's inter-war years may be useful, however, in setting the scene for the rest of the chapter.

During its early history, the E.I. did not merit a separate autonomous existence in official statistics, and was lumped together, partly with Precision Industries such as Jewellery making, and partly, more understandably, with Mechanical Engineering and Shipbuilding. This continued in official statistics and classifications until 1958 (and in overseas investment returns, as late as 1964).

The industry's inclusion with Mechanical Engineering immediately after the first world war was not really surprising. The E.I. employed just over 171,000 people in 1920 or less than 1% of the total U.K. working population (Department of Employment 1971), and accounted for less than 3% of gross U.K. fixed capital formation* in that year. (Feinstein 1965)

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* Using 1930 prices.

TABLE 2.2.

The Percentage of E.I. Sales and Employment by Major Sub-division. 1948.

	% Sales.	% Employment.
Electrical Machinery	40.7	31.9
Wires and Cables	16.7	11.1
Telephone and Telegraphic Apparatus		9.4
Radio and Other Electrical Equipment	10.0	12.9
Miscellaneous (wide definition)	6.4	24.4
Totals:	73.8	89.7
Other	16.2	10.3
	100	100

Source: Calculated from - Report on the Census of Production 1951. H.M.S.O.

During the inter-war years, whilst total U.K. employment figures stayed roughly even, employment in the E.I. doubled. Meanwhile the industry's fixed assets grew at an average annual rate of £3.5m (or 0.8% of the total U.K. average yearly figure) and by 1938 the E.I. was still responsible for less than 1% of gross fixed capital formation in the U.K.*. This increase in the labour intensity of the industry is explained by the large proportion of employment in the Miscellaneous Electrical Products sector (1948 - 24.4%) which produced only 6.4% of the E.I.'s sales. Wires and Cables, and Telephonic and Telegraphic Apparatus by 1948 were using 20.5% of the industry's labour force to produce 16.7% of its sales. The most efficient user of labour in this period was the heavy Electrical Machinery sector with 32% of the industry's employment by 1948, producing nearly 41% of the sales (Table 2.2.). However, this latter sector has declined in importance since this date, and by 1976 it only contributed around 16% of both industry sales and employment.

Table 2.3. shows that in 1935 only one major industrial sector, Leather and Fur Goods, had less establishments (2.3% of total U.K. manufacturing units), than the E.I. (2.7%); whilst the latter produced around 6% of the U.K. sales of manufactured goods (domestic and export), compared with 25.4% by the Food, Drink and Tobacco Industry (F.D.T.), 12.4% by Textiles, 10.5% by Metal Manufacturing, 9% by Mechanical Engineering and Shipbuilding, and 8% in Chemicals and Allied

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* Depreciated Value.

TABLE 2.3.

Numbers of Establishments in U.K. Manufacturing by Industrial Sector. 1935 and 1948.

	1935			1948		
	Nos.	%	Rank	Nos.	%	Rank
Food,Drink,Tobacco	6,857	14.2	2	7,348	13.4	1
Engineering & Shipbuilding	3,287	6.8	6	6,058	11.1	4
Vehicles	2,982	6.2	9	3,770	6.9	8
Metal Manufacturing	1,752	3.6	11	1,998	3.7	12
E.I.	1,295	2.7	12	2,356	4.3	10
Chemicals	1,928	4.0	10	2,304	4.2	11
Textiles	6,955	14.4	1	6,516	11.9	3
Paper	4,428	9.2	4	4,165	7.6	5=
Metal Goods (unspecified)	3,016	6.3	7=	4,172	7.6	5=
Other Manufacturing	1,053	2.2	14	1,631	3.0	13
Bricks,Pottery,Cement	3,056	6.3	7=	2,726	5.0	9
Timber,Furniture	3,829	7.9	5	4,045	7.4	7
Clothing,Footwear	6,716	13.9	3	6,571	12.0	2
Leather,Fur	1,072	2.3	13	1,045	1.9	14
Totals:	48,226	100	-	54,705	100	-

Source: Report on the Census of Production 1951. H.M.S.O.

products.

Out of sixteen major industrial sectors, eleven showed a higher net output than the E.I.. However, the attraction of large scale production was already evident, and establishments in the latter were on average nearly two and a half times larger*, and selling 1.73 times as much per unit, as the average British industrial establishment. Until the second world war the E.I. still operated on a relatively small overall scale, however, concentrating mainly upon the heavy engineering type of activity. By 1935 the industry was still more genuinely an electrical branch of the Mechanical Engineering Industry, with over 51% of total sales being in either Electrical Machinery, or Insulated Wires and Cables (compared with the 1976 figures where Electronics comprises 44.4% of E.I. sales, Instruments a further 13.7% and Electrical Machinery and Wires and Cables only 16.5% and 8.4% respectively.)

In general these industrial sub-divisions were not highly concentrated. Five firm concentration ratios only surpassed 50% in two minimum list headings, (Photographic Instruments, and Telephone and Telegraphic Apparatus**), compared with 1972 where Surgical Instruments alone was below this figure, and only a further three list headings (Electrical Machinery, Optics, and Components) were below

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*Using Net Output

**Batteries stood at 80% but this was a minor sub-division of Miscellaneous Electrical Products, for which the overall figure was not available.

TABLE 2.4.

5- Firm Concentration Ratios (Sales) for the E.I. by Minimum-List-Heading. 1935 - 1972.

	1935	1951	1958	1963	1972
Photographic	79	90	n/a	71	82
Watches & Clocks	36	60	62	84	82
Surgical Instruments	29	25	27	31	33
Optical, Scientific Instruments & Control Systems				51	54(a)
Electrical Machinery	48	44	51	54	54
Wires & Cables	49	48	54	92	87
Telephone & Telegraphic Apparatus	79	75	62	89	93
Electronic Components	n/a	n/a	n/a	35	50
T.V., Radio & Gramophone Equipment	31	21	17	72	78
Data Processing	n/a	n/a	n/a	73	89
Radio, Communications	n/a	n/a	n/a	67	67
Domestic Appliances	56	52	42	90	60
Miscellaneous:- of which					
Motor Vehicle Equipment	n/a	n/a	33	70	82
Batteries	80	74		79	89
Bulbs	37	26		72	n/a
Lighting Equipment				38	48

(a) 1968 figures.

Source : Report on the Census of Production (various issues). H.M.S.O.

the 60% level.* (Table 2.4.).

So, by the beginning of 1939 the E.I. had hardly as yet exploded onto the industrial scene. However, by 1948 things were changing, and the same type of comparisons began to look more advantageous. By this date the E.I. had overtaken Metal Manufacturing and Chemicals in one respect, raising its share of industrial establishments to 4.3%, although it still ranked a long way behind the larger sectors such as F.D.T. (13.4%), Textiles (11.9%), Clothing (12.0%), and Engineering and Shipbuilding (11.1%). However, average firm size in terms of net output was still twice the national average, and therefore, the number of these units underrepresented the E.I.'s size with regard to the rest of the industrial sectors.

Only five industries had a larger share of manufacturing net output (namely Engineering and Shipbuilding; F.D.T.; Vehicles; Metal Manufacturing; and Textiles), and only these five, plus Chemicals, showed a higher sales revenue in 1948. (see Table 2.5.).

By 1948 the E.I. had expanded to 631,000 employees (9.5% of all labour in manufacturing), and was the fourth largest employer in both absolute numbers and total wage bill. (Department of Employment 1971).

This growth, however, was not as yet in any way connected with any noticeable change in the structure of the industry's production base. Electrical Machinery and Insulated Wires

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* Lighting was only 48% but again this is only a sub-division of Miscellaneous Electrical Products.

TABLE 2.5. - Sales of Manufactured Goods by U.K. Industry sector 1948-76.

Sector	1948 Sales (£m)	1948 Rank	1958 Sales	1958 Rank	1968 Sales	1968 Rank	1972 Sales	1972 Rank	1976 Sales	1976 Rank
Food,Drink,Tobacco	2,316	1	4,264	1	7,532	1	9,724	1	19,159	1
Engineering & Shipbuilding	765	4	2,514	2	4,209	2	5,534	2	10,659	2
Vehicles	601	6	2,233	5	3,810	3	5,288	3	9,333	5
Metal Manufacturing	957	3	2,317	3	3,493	4	4,071	6	8,597	6
E.I.	563	7	1,453	7	3,240	5	4,670	4	9,672	4
Chemicals	719	5	2,310	4	3,116	6	4,194	5	10,165	3
Textiles	1,132	2	1,882	6	2,641	7	3,126	8	5,558	9
Paper	450	8	1,256	8	2,366	8	3,422	7	6,782	7
Metal Goods	411	9	1,153	9	2,044	9	2,911	9	5,900	8
Other Manufacturing	222	13	543	12	1,206	10	1,748	10	3,494	10
Bricks,Pottery, Cement	249	11	592	11	1,131	11	1,709	11	3,213	11
Timber,Furniture	228	12	511	13	1,046	12	1,635	12	2,903	12
Clothing,Footwear	410	9	751	10	880	13	1,364	13	2,429	13
Leather,Fur	106	14	138	14	203	14	286	14	486	14
Totals:	9,129	-	21,917	-	36,917	-	49,682	-	98,350	-

Source: Report on the Census of Production (various issues).H.M.S.O.

and Cables still commanded 57.4% of all sales by E.I. companies (actually an increase of over 7% on the pre-war figure), with Electrical Components and Electronic Equipment slipping from a 32.2% share of the market in 1935, to 26% in 1948.

The development of the E.I. thus far had been steady but hardly surprising. However, beginning in the 1950's, throughout the 1960's, and continuing into the 1970's, an acceleration in the rate of growth of the size and performance ability of the industry, took place, relative to the other industrial sectors of the U.K..

2.2.2. 1948 Onwards.

Since 1948 the history of the E.I. has been one of almost continual growth and success. The industry accounting for a larger and larger share of industrial production, employing more and more manpower, spending ever greater amounts upon research, development and technically skilled labour; shifting the emphasis away from the heavy Electrical Engineering sector which had dominated the industry's sales before, and immediately after the second world war; and moving into more specialised fields of high expenditure, high technology, capital and consumer products. (This growth, however, is not equally true of all parts of the industry, nor of all periods of the industry's history).

The period divides neatly into two distinct and differing decades, and a third section of eight years covering the period 1968-76. Therefore the study first deals with the ten years 1948-1958, then the period up to 1968, and finally the eight years to 1976. This is convenient on

three counts. Firstly it facilitates greater comparison of the development of the industry between these differing periods of its history rather than just dealing with these twenty eight years as if exhibiting one continuous trend. Secondly, the midpoint of 1958, reflects fairly accurately the beginnings of the accelerated growth of D.F.I. presence, and the rationalisation of the industrial structure by both foreign owned and indigenous participants. Finally, these dates provide good reference points, as use can be made of the widely available and extensive data coverage of the official Government statistics within several publications including the Census of 1951, 1958, 1968, 1972, and the Business Monitor Series, especially 1974, 1976, and 1978.

1948 - 1958 : During this period the E.I. continued to consolidate its position within the U.K. domestic economy. Sales grew from £563.3m in 1948 to £1,452.7m by 1958 (a total growth of 158% on the 1948 figure), only surpassed by four other industries (Engineering and Shipbuilding, Vehicles, Paper, and Metal Goods). This represents an increase in the industry's share of total industrial sales of marketable goods and services from 4.7% to 5.4% during these ten years. Steady but still not outstanding given the E.I.'s small original base.

The increased production meant higher employment and more establishment facilities. The numbers employed in the industry increased from just over ½m in 1948 to just under ¾m by 1958. This, however, was one of the lowest rates of growth of any sector and reflects the beginning of a movement towards a more capital intensive industry. (The ratio of Capital Ex-

TABLE 2.6. (cont. on the next page).

Employment (Empl.) and Numbers of Establishments (Est.) in U.K. Manufacturing Industry: 1948-76.

Sector	1948				1958				1968			
	000's Empl.	%	Est.	%	000's Empl.	%	Est.	%	000's Empl.	%	Est.	%
Food,Drink,Tobacco	580	8.7	7348	13.4	954	10.6	9213	10.0	835	9.3	6463	7.1
Engineering & Shipbuilding	1029	15.4	6058	11.1	1240	13.7	11793	12.7	1765	19.7	14286	15.6
Vehicles	707	10.6	3770	6.9	1253	13.9	2289	2.5	811	9.0	2631	2.9
Metal Manufacturing	525	7.9	1998	3.7	562	6.2	2876	3.1	580	6.4	3044	3.3
E.I.	631	9.5	2356	4.3	768	8.5	4454	4.8	925	10.3	6287	6.9
Chemicals	338	5.1	2304	4.2	538	6.0	3566	3.8	500	5.6	3047	3.3
Textiles	831	12.4	6516	11.9	927	10.3	8448	9.1	737	8.2	6283	6.9
Paper etc.	405	6.1	4165	7.6	591	6.6	9371	10.1	642	7.2	10395	11.4
Metal Goods	403	6.1	4172	7.6	516	5.7	10588	11.4	569	6.3	11364	12.4
Other Manufacturing	201	3.0	1631	3.0	288	3.2	3389	3.7	354	4.0	4574	5.0
Bricks,Pottery,Cement	272	4.1	2726	5.0	329	3.6	5252	5.7	355	4.0	5125	5.6
Timber,Furniture	219	3.3	4045	7.4	309	3.4	9976	10.8	326	3.6	8995	9.8
Clothing,Footwear	478	7.2	6577	12.0	676	7.5	9603	10.4	518	5.8	7556	8.3
Leather,Fur	58	0.6	1045	1.9	68	0.8	1944	1.9	56	0.6	1482	1.5
Totals	6677	100	54711	100	9019	100	92762	100	8973	100	91532	100

Table 2.6. cont....

Sector	1972				1976			
	000's Empl.	%	Est.	%	000's Empl.	%	Est.	%
Food,Drink Tobacco	756	9.7	5731	6.6	787	10.7	n/a	
Engineering Shipbuilding	1161	15.0	13530	15.6	1070	14.6	n/a	
Vehicles	784	10.1	2382	2.7	766	10.5	n/a	
Metal Manufacturing	516	6.7	2696	3.1	476	6.4	n/a	
E.I.	949	12.3	5975	6.9	911	12.4	n/a	
Chemicals	468	6.0	2792	3.2	405	5.5	n/a	
Textiles	597	7.7	4833	5.6	513	7.0	n/a	
Paper etc.	579	7.5	10029	11.6	556	7.6	n/a	
Metal Goods	516	6.7	11954	13.8	527	7.2	n/a	
Other Manufacturing	339	4.4	4673	5.4	343	4.7	n/a	
Bricks,Pottery, Cement	301	3.9	4497	5.2	261	3.6	n/a	
Timber, Furniture	275	3.6	9045	10.5	258	3.5	n/a	
Clothing, Footwear	450	5.8	7064	8.1	421	5.7	n/a	
Leather,Fur	46	0.6	1470	1.7	41	0.6	n/a	
Totals	7737	100	86721	100	7335	100	-	-

Source: Report on the Census of Production, (various issues). H.M.S.O.

penditure/ Wage Bill rose from 8% in 1935 to 13% by 1970).

The rate of overall growth meant that only 0.3% of the industry's available workforce were unemployed in 1958 (the E.I. accounting for less than 0.7% of total U.K. unemployment). The number of establishments operating within the E.I. rose by 89% on the 1948 level by the end of this decade, but this again was fairly low compared with the other industrial sectors. (See Table 2.6.).

Average firm size grew in direct proportion to the rest of the U.K's industrial sectors, and remained at about 2½ times the national manufacturing average, reflecting the continuing existence of the economies of large scale production witnessed in the inter-war period. More importantly the E.I. displayed the second highest growth rate of net output in the U.K., and as a rough measure of value added by the industrial sectors, and therefore their contribution to the economic growth of the domestic economy, it shows the increasing importance of the E.I. with regard to the total manufacturing industry (Table 2.7.).

1958 - 1968: This decade saw the E.I. maintaining its sales performance with a 123% growth on the 1958 figure, a greater increase by far than any other industrial sector (the next highest being Timber 104%, Brick, Pottery and Cement 91% and Paper 88%).

Rapid sales growth allowed the E.I. the highest rate of increase in employment, and its 41% increase in the number of industrial establishments was again the greatest growth of any sector in this period. The capital intensity of the E.I. continued to expand (see 1968-76) and the level of gross

TABLE 2.7.

Growth of Net Output in the U.K. Manufacturing Industry : by industry 1948-76.

Sector	(%) 1948-58	Rank	(%) 1958-68	Rank	(%) 1968-76	Rank
Food,Drink,Tobacco	109.0	7	100.9	7	220.4	4
Engineering & Shipbuilding	126.0	4	80.1	10	162.1	12
Vehicles	129.2	3	92.9	9	163.2	11
Metal Manufacturing	115.7	6	55.1	14	182.6	9
E.I.	131.5	2	130.1	2	203.3	6
Chemicals	183.8	1	106.0	6	244.3	1
Textiles	43.6	13	72.1	10	123.7	14
Paper	124.7	5	108.2	5	194.2	8
Metal Goods	105.8	8	109.8	4	211.7	5
Other Manufacturing	96.0	10	167.9	1	201.1	7
Bricks,Pottery, Cement	101.2	9	93.8	8	233.2	2
Timber,Furniture	89.0	11	113.3	3	222.0	3
Clothing,Footwear	60.2	12	56.9	13	154.4	13
Leather,Fur	0.7	14	65.4	12	170.9	10

Source: Calculated from figures for net output in the Report on the Census of Production (various issues), H.M.S.O.

domestic capital formation rose by 118% between 1962 and 1971, a figure which by far outweighed even the 21.5% rise in employment.

Average firm size continued to stay about 2½ times the national average, and all this added up to a growth in net profits for the period 1963-72 at a faster rate than any other industry (71%).

1958-68 saw the industry with the largest increase in net output of any sector, with the E.I. now accounting for 8.8% of all manufacturing sales, and 9% of U.K. exports of manufactured goods and services. However, a large part of this growth had been fed by an increase in the industry's imports until by 1968 they stood at 60% of the total export figure (1958- 19%), but this was still a good deal better than the aggregate industrial performance of a 23% deficit on balance of trade.

1968 - 1976: This trend continued with sales rising by a further 198.5% (1976) and exports reaching £1151.1m by 1973, a doubling of the 1968 figure of £578.2m. Imports of Electrical and Instrument Engineering products grew at an even greater pace to £1156.8m which meant that in 1973 the E.I.'s exports were completely offset by these imports.

The general squeezing of the economy in the anti-inflation policies of the 1970's has been felt by the industry, and employment,which topped the million mark in 1971, dipped back to 911,300 (12.4% of the U.K's working population

in manufacturing) in 1976, and unemployment in the industry reached 2.7% compared with the 3.4% average in all manufacturing industries.

The number of establishments fell by 100 to 6188 in 1971, but this still meant that the E.I.'s share of all industrial establishments rose from 3.62% in 1968 to 6.68% in 1971. (6.9% of manufacturing establishments, a figure which was maintained in 1972, though the total number credited to the E.I. fell to 5975).

Even during these lean years the industry managed the 198.5% growth in sales whilst the increase in aggregate sales of the remainder of the U.K. manufacturing industry was only 163.3%. In 1972 the E.I. had overtaken Metal Manufacturing in terms of sales turnover, to become the fourth largest contributor to total U.K. manufacturing output with 9.4% of such sales, a position maintained in 1976, when the E.I. contributed 9.8% of manufacturing sales.

The 4 years 1968-72 saw the E.I. as the only industry to increase its absolute level of employment and between 1972 and 1976 although the level of employment dropped below the 1968 level, this reduction compares favourably with the other manufacturing sectors. The wage bill grew consistently, although the E.I. has not suffered as badly as many of the other industrial areas from large scale wage settlements with protracted wage bargaining and its associated disruptions. This has enabled large scale expansion of production facilities without crippling labour costs, and therefore, the ability to make reasonably competitive products, as reflected by the generally increasing share of net output attributable to this

sector until 1972. (1948-8.4%; 1958-9.3% 1968-11.0%; 1972-11.1%). However this figure dropped to 9.8% by 1976 probably attributable to the differential impact of the oil crisis, felt particularly acutely in the E.I. which requires a large input from oil derivative products on the one hand and the output of which requires a wide range of oil based complementary products on the other. The slackening off of the rate of growth in the early and middle 1970's is shown in Table 2.7. where the E.I. slipped from second to sixth place in the "league table" of growth of net output over the period 1968-76.

During this twenty-eight year period the E.I. has captured over a further 1% of U.K. sales of manufactured goods. The general prosperity of the manufacturing sector is reflected in the 1948-58 data, but the significant figure is the quadrupling of the E.I.'s sales turnover in the leaner times of 1958-74 (329.3% rise), whilst total industrial production of manufactured goods (other than E.I.) rose by only 95.9% in the same period.

The average firm size in the E.I. continues to be substantially larger than the industrial average, suggesting the existence of industry specific economies of scale. This would appear necessary considering the higher wage rates paid to workers in this industry with regard the norm, and the E.I.'s share of around 11½% of the total wage and salary bill for all U.K. industry, whilst employing only around 4½% of the country's workforce. This is hardly surprising given the large expenditures upon highly trained R&D personnel and technical staff (by 1972/3 the industry was spending just under 29% of the U.K.'s total expenditure upon R&D.), and

the high current/capital expenditure ratio of the component assemblers. This is demonstrated by the high gross/net profit ratio (therefore low depreciation allowances), supported by the low level of Gross Domestic Capital Formation compared with high net asset worth. This and earlier evidence suggests large firm size when based on sales and net output calculations, yet smaller employment units, with high wages and generally low investment in capital goods per employee ratios, a trend which is now being reversed with the more capital intensive methods in the growing Electronics sector.

Ratios of Capital Expenditure/Wage Bill for the three major sub-sections of the E.I., namely Instrument Engineering, Electrical Engineering and Electronics, would suggest that the biggest contributor to the increasing level of capital intensiveness is the Electronics sector. Electronics has become more capital intensive (11.5% in 1963; 14.9% in 1972), the Instrument sector remained constant (10.3% in 1963; 10.5% in 1972) and the capital intensiveness of the firms engaged in Electrical Engineering has fallen significantly from an originally higher level than that of Electronics to a much lower level at present (12.5% in 1963; 9.9% in 1972).

Net profits (pre-tax)/Net assets figures, as a rate of return on committed capital after depreciation allowances, had shown a declining trend until 1967, then after an exceptional year in 1968 following devaluation, the trend has been steadily upwards from a lower base. The figure stood at a 23.2. rate of return (1974) whilst the manufacturing sector as a whole has shown a worsening trend until 1974

the rate of return stood at only 11.7%. All of this would tend to suggest an E.I. industry of greater efficiency as measured by labour productivity and rate of return on long term capital, than manufacturing on average in the U.K.. However, this is just the overall picture of the industry, and attention is now focused on the minimum list headings.

Within the industry the largest individual sector is still (1976) Electrical Machinery with 16.5% of total industry sales (15.6% of employment), followed closely by Instruments, 12.8% (16.1%) and the 10.3% (13.1%) in Radio and Other Electrical Goods. Grouping together like commodities, Electronic Capital Equipment and its components is now by far the largest group, with over a quarter of total industry sales.

Table 2.8. shows the relative importance of the minimum list headings in 1976, in terms of sales and employment figures. These figures support our earlier contention that the poor wages/capital expenditure ratios are exaggerated by the history of excessive labour intensiveness in the older Electrical and Instrument Engineering sectors. Meanwhile in Electronics the trend is for high levels of capitalisation in assembly line production with low wages paid to unskilled workers being offset by the high salaries earned in the technostructure covering up the true capital intensiveness of the sector.

Earlier tables have shown heavy concentration of production activity in all sectors, but most notably in Telephone and Telegraphic Equipment; Wires and Cables; Data Processing; Photographic Equipment; Sound and Vision Receiving

TABLE 2.8.

Sales and Employment in the E.I. in 1976, by minimum list headings.

	Sales £m.	%	Employment 000's	%
Instruments	1,193.7	12.9	147.3	16.1
Watches & Clocks	81.3	0.9	13.2	1.4
Electrical Machinery	1,527.2	16.5	142.7	15.6
Wires and Cables	779.5	8.4	44.6	4.9
Telephone & Telegraphic Apparatus	809.5	8.7	98.5	10.9
Radio and Other Electrical	955.7	10.3	119.8	13.1
Broadcasting and Sound Receiving Equipment	804.9	8.7	49.7	5.4
Computers (a)	556.3	6.0	29.5	3.2
Radio,Radar,Capital Goods	994.8	10.7	100.5	11.1
Domestic Appliances	653.9	7.0	60.9	6.7
Miscellaneous	923.0	9.9	106.1	11.6
Totals:	9,279.8	100	912.8	100

(a) 1975 figures.

Source : Census of Production: Provisional Results, 1976.H.M.S.O.

Apparatus, and various Miscellaneous Electrical products, where 5-firm concentration ratios are consistently higher than 80%.

The fastest growth of productive capacity in recent years has been in the Computer Industry, followed mostly by other sectors of Electronics, Sales between 1954-74 increased 10-fold whilst in the two other major sectors, Instruments totalled a 6-fold growth and Electrical Machinery only 3.5.. The Electronics sector also contains the largest part of the expenditure upon R&D, and spends a higher percentage of this upon development than the other sectors of the E.I., although it must be noted that all three spend at least 75% of their innovative effort upon development. Also the majority of this money goes on wages as opposed to Materials or Capital Facilities, with a higher percentage coming from the Public Sector than the industrial average.

This dependence upon technological progress meant that by 1960 the Electronics sector had twice as many scientifically skilled personnel per hundred employees as the two other sectors of the E.I.. (Federation of British Industry 1961). This figure was more responsive to company size than either Instrument or Electrical Engineering, and whilst the percentage rose with company size in these latter two sectors, it fell by half for the specialist electronics firms, which would suggest greater economies of scale are available in the R&D function of the Electronics sector. This does not mean that large companies have smaller R&D departments than smaller firms, only less such employees relative to total employment.

This is mainly because Instrument and Electrical Engineering companies tend to be in closer direct contact with the final consumer, and spend about 50% of their R&D man hours and expenditure upon the creation of new product lines, a function which tends to expand with firm size. Whereas the Electronics specialists spread their R&D effort more evenly across all the research aspects, including technical services, product improvement and basic research, which allow for greater economies of scale to be exploited, as the innovatory content of R&D is fairly constant. During the 1960's the technological base of Electronics expanded even more rapidly. By 1965 scientific and technical staff accounted for 11.3% of employment in the sector. This grew to 14.4% by 1969, and in 1971 the proportion stood at 15%. During this period the Electronics companies share of the total R&D expenditure by the E.I. both internally and externally financed, rose from 66.4% in 1964/5 to 71.8% in 1969/70. This movement, a reflection of the world's entry into the 'age of technology', has been, and continues to be, an important factor in the development of electronics.

Obviously the economic difficulties of the 1970's in the U.K. economy will have had further ramifications for the E.I., however, official statistics for this later period are as yet greatly disaggregated and often either completely unavailable, or based upon estimates. Firms are often uneasy as to the supply of unrepresentative data in such times, and therefore sometimes unresponsive to personal approaches, hence 1976 is the last date that this study considers the aggregate data completely accurate. However, from the lim-

ited data available since 1976 it seems true to say that the bulk of the aforementioned trends still continue to the present day.

Within the three major subdivisions of the industry in 1976, the major activity within the Instruments sector was still within Scientific and Industrial Instruments, whilst Electrical Engineering shares its production fairly evenly between Electricity Supply Equipment (25%), Industrial Machinery (40%), and Consumer Goods (35%). Finally the Electronics sector is most heavily involved in Capital Equipment for Civil Purposes, Computers, Telecommunications and Components; Consumer Products involving only around 15% of this sector's activity.

Hindsight shows that the growth of the industry, and the development of its product-market scope has been both market orientated and yet at the same time responsive to political pressures. It has been determined by the market in that much of the industry's diverse production still comes from large electrical engineering combines. This is not simply because of the industry's original growth out of this sector, but is due also to the need of these companies to protect their interests in allied fields. Their growth is based upon the production and sales demands made by such products as domestic utility goods, often requiring mass production methods and the resulting high levels of capital investment.

Meanwhile the political effects of defence and other Government sector spending have often led companies into product mixes which may not have arisen given the normally

prevailing commercially competitive conditions. This is to be expected in such industries as the E.I. at the forefront of technological development, and in particular when working in the realms of military, space, nuclear and other politically sensitive areas.

Progress across the industry has varied. Some firms are not as go-ahead as others. A.E.I. and English Electric have been swallowed up, and for all their size and history it is difficult to see how they could have achieved the dominance of Philips or Siemens in their respective countries.

One of the fascinations of the industry is that so much is dependent on the quality of the management.

> "It is growing not just in size, but also in technological expertise, the bounds are as wide as managerial and technical knowledge can make them." (Malik 1964)

Malik suggests that the British sector of the E.I. could, through lack of research and engineering skills, and the inconsistency of Government money, move too far away from the research, development and original manufacture of electrical products, towards the field of component assembly.

The main danger is that whilst this area contains some of the most aggressive companies of the British industrial scene, and it is these companies that have continually pushed the production index well above that for all industry, these companies are not always of domestic origin. For example, by 1964 the largest component manufacturer in the U.K. was Mullards, a subsidiary of Dutch Philips. I.B.M.'s production alone in computer electronics rivals the contribution of

British owned I.C.L., and we can add to this the output of Honeywell, Remington Rand, Hewlett Packard, Texas Instruments and Burroughs, among other well known foreign owned companies. By 1964 E.A.L. and Solarton dominated the analogue computer market, the latter being an example of post-war British innovation bought out by a U.S. parent. In the field of transistors and semi-conductors, the majority of the market is controlled by Mullards and Texas Instruments. The role of such companies in the development of the E.I. is considered in section 2.4.

2.3. The World Industry.

It is important to consider the E.I. in an international setting as well as in the context of the development of the U.K. domestic economy. It is difficult to draw very precise international comparisons, not least because of fluctuations in national currency parities against the U.S. dollar (the usual unit of comparison), differing accounting practices, and also because of other significant discrepancies in statistical definitions, with even the complete absence of aggregate data for some countries. However, an attempt is made to make limited comparisons based on figures for Value of Shipments and Services Rendered, Value Added, Employment, Wage Bill, and Capital Investment in Fixed Assets.

Whereas the E.I. has been seen to be a very successful sector of the U.K. economy, in the global setting, the U.K. industry faces a highly competitive situation. Table 2.9.

shows the shares of world trade* by the advanced industrial countries, including the U.K., as identified in the trade statistics. These provide an important indication of changes in the E.I.'s competitive position over the middle and late 1960's.

In common with other sectors of U.K. industry, the E.I. suffered a serious loss of share of world trade between 1966 and 1968, regained this by 1970, and by 1971 was expanding faster than the average for all advanced countries. This increase was largely caused by the substantial growth in the U.K. exports of electrical power machinery and circuit apparatus. Undoubtably the 1967 devaluation, which aimed at bringing U.K. costs into line with those of other countries, contributed to this improvement in performance. The fact that the pressure of demand in the U.K. economy was significantly lower than in those of her competitors during these years probably also helped (supported by the fact that the U.K. has suffered a further loss of trade share during the inflationary demand pressure since 1972). This is reflected in the growth of the rate of return on sales of the U.K.'s largest companies in the E.I., rising from 1.9% in 1962, to 5.3% in 1972. This was the highest rate of growth of any developed country in any other industry except the Japanese Electrical Engineering and Electronics Industry (Dunning and Pearce 1975).**

Whereas the rate of increase of output per man-hour has, with the exception of the U.S. been least in the U.K. for all advanced industrial countries' manufacturing sectors,

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*O.E.C.D. countries only.

**See Dunning (1978) for further discussion .

TABLE 2.9.

Share of World Trade* in E.I. by Seven Largest Producers :

1963 - 70.

	%	%	%	%
	1963	1966	1968	1970
U.K.	6.8	6.5	5.9	6.9
U.S.A.	59.3	57.5	57.8	50.8
Germany	10.0	10.1	7.7	10.2
France	6.0	5.6	5.2	6.3
Japan	11.6	11.7	14.7	19.5
Netherlands	1.5	1.5	1.4	1.6
Canada	2.3	2.3	2.7	2.7
Total :	97.5	95.2	95.4	98.0

*O.E.C.D. Member Countries Only.

Source: O.E.C.D. Statistics for Engineering :1972.

the E.I.'s relationship between total shipments and the wages paid to produce those goods has been second only to Japan since 1970. However, this is probably exaggerated by the fact that the British workforce is poorly paid by international standards, and the same ratio using the figures for employment, rather than wages, is a good deal worse. There is the fact, therefore, that this performance could be even better given a higher rate of capital investment per employee in the U.K. industry, this being significantly lower than her major competitors (Table 2.10.). This is because, despite the U.K.'s low level of wages, the slower rate of increase in productivity in the U.K. industry has been reflected in the tendency for U.K. labour costs per unit of output to rise faster in recent years, than those of any other major producing country.

Though such costs increased faster in the U.K., hourly wage rates increased no more rapidly than elsewhere, which would suggest higher costs being brought about by excess labour capacity and inefficiency of labour usage. Therefore, it is possible to talk paradoxically, about poorly paid workers on the one hand, whilst referring to basic wages in the international context, and to say on the other hand that labour costs per unit of output are high in the U.K. industry.

To counteract this, and to keep U.K. unit costs in line with its competitors, the devaluation of 1967, and the downward 'float' of sterling since 1971 have been needed. These tendencies must be matters for concern, and underlie the great importance which will probably be attached to the achievement of a faster growth of productivity in future years.

TABLE 2.10.

Productivity and Investment Ratios in the World E.I. : 1963 - 70.

	1963		1966		1968		1970	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
U.K.	3.7	270	4.0	300	4.3	250	5.0	350
U.S.A.	3.2	600	3.4	800	3.7	N/A	3.4	N/A
Germany	2.7	400	2.9	450	2.6	430	2.8	N/A
France	3.8	515	3.9	580	4.2	840	4.1	690
Japan	7.4	400	7.5	430	7.5	N/A	7.6	N/A
Neths.	4.2	800	3.9	770	4.0	610	3.9	N/A
Canada	3.3	N/A	3.4	N/A	4.0	N/A	3.8	N/A

(a) : Shipments / Wage Bill

(b) : Investment in Capital Goods / Numbers of Employees

Source : Calculated from - O.E.C.D. Statistics for Engineering: 1972.

It was seen earlier that the Electrical Engineering sector produced the best balance of trade results within the E.I., however, this is a declining share of total shipments, the biggest movement being into Instruments and Electronics. Apart from the Netherlands, the U.K. is the only country to be significantly expanding Instruments, but is in line with all countries, other than the U.S., in the expansion of the Electronics sector. Even given this movement into highly skilled, high technology Electronics, the U.K.'s overdependence upon the work of component assembly is reflected in the fact that the U.K.'s E.I. workers are on average the lowest paid of any major industrial nation, and investment in capital goods per employee, is poor.

Meanwhile, examining the figures for value added by the E.I., Instruments and Electronics show a higher percentage return than Electrical Engineering, thus the industry seems to be moving in the right direction, and whilst growth in value added has not been spectacular, it has at least been steady. In 1970 the U.K. was the fourth largest producer of Electrical and Instrument Engineering products, behind the U.S., Japan and Germany; with only Japan and Germany showing a significantly higher growth rate between 1968-70.

2.4. Industry Rationalisation and the Individual Company.

So far the study has been concerned mainly with the development and performance of the E.I. as a whole, and its component minimum-list-headings. Now the role of the major individual companies within the aggregate changes is intro-

duced. Interrelationships exist, and whereas performance is dependent upon efficiency, this in turn is constrained by the firm's ability to adapt to the changing industrial structure, whether it be as the instigator of, or merely in reaction to, these changes.*

Obviously the rapid growth of the E.I. since the second world war, and the realignment of its inherent industrial sectors, will affect the development of the companies involved. The structure of any industry is an ephemeral thing, completely dependent for its final form upon the operations of the companies within it. These companies have seen great changes, particularly during the past two and a half decades. During this period the face of the industry's largest companies has changed drastically. A list of the ten largest firms in 1976, shows several of the companies in a similar list for 1966. However, not only do three completely new names appear, but the interrelationship between the rest has altered.

Table 2.11 shows that in 1966 Hawker Siddeley was by far the largest company by turnover in the E.I., with A.E.I., B.I.C.C., and English Electric vieing closely for second place. Two of this latter group have now disappeared from the list, swallowed up by the smaller G.E.C.. Since then, Rank Xerox, E.M.I. and I.B.M. have expanded to become companies of much greater standing within the E.I.. Only Hawker Siddeley and B.I.C.C. have roughly retained their high position in the "league", with upward movements most noticeable by G.E.C., Thorn, and Philips. The Rank Organisation has disappeared and Lucas has experienced a fall in

*For case-study material also see, Channon (1973) and Sciberras (1979)

TABLE 2.11.

Ranking of Top Ten Companies by Turnover in the E.I. - 1966 & 1976.

	1975/6	£ooo's	1965/6	£ooo's
1.	G.E.C.	1,144,205	Hawker Siddeley	344,000
2.	B.I.C.C.	782,000	A.E.I.	254,453
3.	Hawker Siddeley	636,905	B.I.C.C.	254,000
4.	Thorn	632,420	English Electric	244,839
5.	Philips	494,000	Lucas	174,800
6.	Rank Xerox	482,357	G.E.C.	170,100
7.	Lucas	452,771	Rank Organisation	127,141
8.	E.M.I.	399,810	Plessey	104,800
9.	Plessey	399,502	Thorn	-
10.	I.B.M.	344,902	Philips	-

Source: Times 1000 1975/6

Times 500 1965/6

standing, whilst Plessey has remained near the foot of the table.

Such movements are symptomatic of the great changes taking place within the industry. With large scale rationalisation, these 25 years have witnessed the emergence of the multi-billion pound, multi-national giant; the rapid expansion of technological skills and expertise; the need for ever higher levels of capital commitment; and the growing dominance of the Electronics sector within the industry. Electrical and Electronics companies are often engaged in activities revolving around a common technology that is highly transferable to a wide range of related consumer and industrial markets. Since the second world war there have been considerable technological and market changes within the industry. For example, the growth in ownership of both large and small consumer appliances; the advent of the computer age; and the increasing development of electronics and its wide range of micro-circuitry, have all served to alter the product mix of manufacturers and help develop pressures upon the process structure of the larger companies.

Many companies have concentrated upon specific market segments where they are able to maintain a competitive position, despite the presence of a few, large full-line manufacturers.

In order to combine an examination of company reaction to the growing age of technology and the subsequent rise of the E.I., with a familiarisation of the industry's leading companies, a case study technique would appear to be the best approach to this section. A short history of the major

firms of the E.I. is therefore presented, with an attempt in each case to show the company's reaction to the changing face of the industry and the general economic environment, and pinpoint the contribution that can be made by individual companies to the changing industrial structure.

Competitive entry was initially easy in the rapidly expanding number of market segments which allowed time for the build-up of the necessary technical skills and financial resources to permit further diversification. Indeed, the breadth of market was such, that the full-line manufacturers were increasingly forced to concentrate themselves on order to remain competitive. (Channon 1973).

Meanwhile the level of competition within the industry has increased. (Allen 1969). In 1950 restrictive agreements covered many product markets, especially where product differentiation was low, such as in light bulbs and components. These restrictions have been gradually broken down. During the 1960's increased competition came from foreign manufacturers, especially Japan, Holland, Italy and the U.S.A.. As later evidence will show, these competitors have concentrated on the markets for consumer products and electronic equipment, and as a result, within these sectors attention has been given to the achievement of economies of scale, in order that the British concerns could remain competitive. This would tend to lead to greater integration of process, with higher degrees of product specialisation and less diversification. (Bain 1956 and 1968).

Growth rates and profitability have been generally above the industrial average, and this is reflected in the perform-

ance of the individual companies. This is not universally true, however, and fluctuations in the heavy electrical machinery sector, for example, have led to success by companies heavily committed in this field. (Channon 1973). This market, and that of telecommunications equipment is dominated domestically by the public sector enterprise, which in many areas face a monopsonist, namely the public utility.

In general the electrical companies were early adopters of a multiproduct divisional structure, becoming widely accepted during the 1950's. Previously organisations tended to be functionally based only. This trend has facilitated the development, and greater control of, much more complex product and process structures. After the second world war, producers initially enjoyed the boom of postwar reconstruction. Rapid expansion took place internally, supported by acquisition, and during the 1950's profit levels rose accordingly.

A.E.I. (Associated Electrical Industries), the company which expanded the most during the early postwar boom, was possibly the worst hit as the boom began to fade. Profits declined in the light of increased competition and overcapacity in the late 1950's. The five subsidiary groups and their functional structure resulted in wasteful duplication, and ineffectual central policy making. On September 28th. 1967, G.E.C. (General Electric Company) encouraged by the I.R.C. (Industrial Reorganisation Corporation), made a successful takeover bid.

English Electric was added to the group in 1968, a company also suffering problems (albeit not as acute as those of A.E.I.), after doing well during the initial postwar period, English Electric was involved heavily in the high

growth areas of electronics and automation equipment, as well as the not so profitable heavy electrical plant market.

The merger represented the creation of a global scale conglomerate, helped rationalise the heavy electrical machinery industry, reshaped the power balance within the domestic electrical appliance sector, and gave the enlarged G.E.C.a balanced three market strategy with interests in electrical machinery, domestic appliances and systems electronics. Initially G.E.C. had been much smaller than either of the two acquired companies, but the aggressive management qualities and well organised structural set up attracted the interest and support of the I.R.C.. Here the rapid development of the E.I. and the changing importance of its minimum-list-headings created the need for company rationalisation. Once this came about with the merger of three of the larger companies of the industry it was inevitable that the overall structure of the E.I. must be significantly altered. The enlarged company has continued to use its new dominant position to expand further and continually modify the industrial structure.

Plessey had also been interested and made a bid for English Electric, and should the move have been successful the structure of the E.I. would have taken a different profile. However, the I.R.C. preferred the case for the proposed G.E.C. merger. This company was not a full-line electrical goods producer, but concentrated in the fields of telecommunications, components and electronics. Such concentration in rapid growth areas has been reflected in a very high rate of corporate expansion, although this has been

helped enormously by acquisitions, (sales have expanded from £19.4m in 1956 to over £200m by 1970, and in 1975/6 the figure stood at £400m).

During the 1950's the company concentrated on the production of a multiplicity of electrical components, performed only modest research, and depended for its technology largely on licenses from U.S. companies. In 1962 Plessey acquired two major telecommunications companies, which helped lay the foundation of the telecommunications group which was to be the main growth area in the 1960's, and the highly successful Garrard Company, manufacturers of record changers. These, however, still do not represent a major diversification.

Like Plessey, many other British electrical and electronics companies also adopted a strategy of concentration within specialised niches of the industry.

E.M.I. has repeatedly divested itself of those parts of the product mix which the company has considered inadequately profitable, or not seen fitting the overall competitive strategy. Whilst the company is diversified in many features of the entertainment industry, the electronics division is heavily concentrated in the manufacture of electronic control and navigation systems, and domestic appliances.

The electronics side of E.M.I.'s operations has become more streamlined in the past twenty years. In 1957, radio and T.V. production ceased with the formation of the British Radio Corporation, whereby E.M.I. retained only their overseas retail outlets, and Thorn manufactured sets for sale by both companies. The domestic appliance production line was increased by the acquisition of Morphy-Richards in 1960, later to become British Domestic Appliances in 1966 when

merged with similar A.E.I. interests in the face of nation-wide overcapacity in this field.

In recent years, whilst E.M.I.'s strategy has turned more and more towards becoming an integrated leisure and entertainment company, expansion of the electronics sector continues on a more specialist line. Acquisition of Associated Fire Alarms, and Minerva Fire Defence Systems in 1970, were intended specifically to develop the capabilities originally created to provide military defence systems twenty-five years earlier. This trend continues with the purchase of S.E. Laboratories and B.M.F. Instruments of Philadelphia, both with interests in connectors and marine radar. The aggressive policy of expansion by acquisition has also played its part in the changing structure of the industry.

Thorn Electric was also a specialised producer of light electrical goods. The company's product and process structure has, however, undergone a major transformation with diversification into a wider range of domestic electrical consumer products, and vertical integration, upstream into component manufacture, and downstream into consumer services, retailing and rentals.

In contrast, Reyrolle Parsons have remained largely undiversified. The present company was only formed in 1967 as part of the rationalisation of the heavy electrical industry, stemming from the G.E.C./A.E.I. merger. The three companies involved were Reyrolle, concentrating on the production of switchgear; C.A. Parsons, producing turbogenerators and transformers; and Bruce Peebles, another transformer company. The individual firms still retain much of their original identities

and autonomy.

Here then we have two companies, contributing in contrasting ways to the changing industrial structure. Thorn by diversification into a wide range of light electrical products, and a heavily rationalised process structure; and Reyrolle Parsons by restructuring of a specific sector of the E.I. and the formation of a large enterprise with concentrated interests in electrical machinery.

The British subsidiary of America's I.B.M. (International Business Machines) was formed originally as a holding company with diversified interests in accounting machines, time recording equipment; and weighing machines. During the latter part of the second world war, the parent company became increasingly involved in the growth of the computer industry. Operations in Britain were extended into this new field in direct competition with British Tabulating Machine Company, who already held an exclusive licence from the parent company on products then in the I.B.M. line and patents still pending.

I.B.M. (U.K.) rapidly surpassed the British owned company (which eventually became part of I.C.L.), in spite of Government sponsorship of the domestically owned sector. Today I.B.M. (U.K.) is a highly specialised computer company, controlling over one-third of the U.K. market. Its only serious competitor is the hybrid British owned I.C.L. (International Computers Ltd.), another dominant single sector Company, combining the computer interests of G.E.C.'s English Electric Computers Ltd., Plessey's Computer Division, and International Computers and Tabulators Ltd.. I.C.L. controls nearly half of the U.K. domestic computer market, and was

created as a direct response to the dominance of I.B.M. and the other larger U.S. computer firms. The main justification for the I.C.L. partnership would appear to be based upon the grounds of technological progressiveness. That only as a united industry could the British computer interests compete with their U.S. rivals on the technological front. It can be argued that in computers, and more generally in electronics in toto, the rate of technological progress is so fast that only by keeping up with its rapid advance can a company not only hope to compete, but stay in existence at all, i.e. the benefits stemming from technological change cannot be matched by any other competitive mechanism. This assumption would appear to be supported by the dominant position of I.B.M., which controls 70% of the world's computer market, thus greatly reducing the opportunity for successful competition by smaller companies by exploiting its own economies of scale effectively. The only way, therefore, that the British owned companies could mount a successful attack upon the U.S. giant was on the basis of technological superiority and specialisation. Once again an example of industry rationalisation sparked off by the face to face competitive environment of the individual company.

Joseph Lucas and Smiths Industries are both heavily engaged in electrical automobile components, and are market leaders in their respective product lines. They have been investigated by the Monopolies Commission (1963), as part of an inquiry into the supply of automobile instruments and electrical components, and indeed until 1956 a restrictive agreement was in effect, whereby each company avoided com-

petition with the other by concentrating on exclusive market segments.

Both companies have experienced some degree of product diversification. Lucas have developed interests in instruments, electronic components and hydraulics, but these industrial activities are still small, and the company primarily continues to be a manufacturer of automobile and aircraft electrical components. Smiths Industries is in many respects similar to Lucas. The company concentrated upon instruments, diversifying into the related areas of control systems and watches and clocks after the second world war.

Both companies have had setbacks in recent years, however. Multisourcing policy by the vehicle manufacturing companies after strikes affecting the component manufacturers, and increasing competition from new market entrants, especially backward integration by the vehicle assemblers, had led to a weakening of the cartel, and particularly the dominance of Lucas. Meanwhile, government changes in aviation policy, the self-manufacturing by Ford, and cheap imports of watches and clocks, has led to a subsequent loss of business in instruments and components, and of course, watches and clocks for Smiths Industries. An attempt to reduce dependency on these markets, has led the company into the field of Medical Equipment, and out of the E.I. completely, into building supplies and industrial ceramics.

For these companies the market is becoming more competitive, with the resultant development of a diversified product mix, and loss of monopoly profit.

Hawker Siddeley undertook extensive diversification in

the late 1950's as protection against the possible decline of the aircraft industry, but has now streamlined operations and concentrates heavily on aerospace and associated electronic equipment. Most foreign subsidiaries follow this example, and that of I.B.M., with greater market specialisation.

S.T.C. (Standard Telephones and Cables), the British subsidiary of I.T.T. (International Telephone and Telegraph) is engaged in telephone equipment production and operations. It is only slightly diversified into related fields.

Philips N.V. of Eindhoven was one of the earliest examples of a European company with a multiproduct divisional structure, created by takeover and open field venture into the U.K. domestic market. Initially a lamp maker, Philips is now a widely spread conglomerate company, with a highly diversified product mix, and a large number of subsidiary companies in the U.K.. After 1945 expansion and rapid technological change led to diversification in electronics and consumer appliances, yielding the present highly diversified, multinational concern. However, the subsidiaries under Philips ownership are allowed a reasonable degree of autonomy, and most are highly specialised operations.

Kodak demonstrates a high degree of market specialisation with a greatly developed integrated structure, both up, and down stream. Babcock and Wilcox again show a specific product range with only moderate diversification.

Meanwhile the British companies tend to be more diversified, with electronics often comprising no more than a division of a large conglomerate. For example, the Rank Organisation, Tube Investments, George Kent and Vickers. There are ex-

ceptions, however, such as B.I.C.C. and its concentration solely upon cables and peripheral products.

Examination of these corporate histories reveals that strategically the electrical and electronics companies were early diversifiers. Technological development ensured the institutionalisation of the search for new products by the development of extensive internal research capabilities. Acquisition has also proved a significant element in company and industry development, especially among the newer concerns such as Thorn, Plessey, Reyrolle Parsons and I.T.T.. The growth of competition in the postwar period was also a significant factor towards the merger activity of the 1960's, and this in turn has led to considerable restructuring of the British E.I..

These firms have grown by relating their product range to a common technology or skill which proved highly adaptable for a variety of market needs. Initial structural change was often the result of acquisition but many institutionalised the change and ensured its continuing development by the process of R&D.. Several companies, however, still appear weak in the initiation of new products, and have been forced to rely on licensed technology or acquisition for generating product innovations.

On average, though, growth rates have been above the mean and sustained partly by the constant development of new markets and product innovation. The wide range of markets served resulted in the past in low barriers to entry, however, greater degrees of merger activity, combined with the high costs of R&D and the high capital intensity of the manufacturing pro-

cesses involved in the E.I. have possibly increased the difficulties of market entry. This is one hypothesis to be tested in the next chapter. Much of this has stemmed from the lack of ability of firms to cover the full-line of products, and their increased specialisation in specific segments of the market, which facilitates greater technological expertise, and the creation of cartel "arrangements".

The role of the merger, and the boom during the 1960's of merger activity has played a major role in the restructuring of the E.I., and again this is another factor to be examined in the next chapter. It is sufficient at this point to realise that various types of merger have taken place, both in response to, and also leading to, pressures for structural change.

The G.E.C./A.E.I./English Electric merger is of an aggressive type expansion as also are the E.M.I. diversifying acquisitions. There have been those aimed at market domination by such companies as B.I.C.C., and those for a modification of product and/or process structure; diversification by E.M.I., Philips, Hawker Siddeley and the Rank Organisation; and vertical integration by I.B.M., Thorn and Kodak.

Some companies have created overseas trade associations, Plessey with Alloys Unlimited (U.S.) and B.I.C.C. with General Cables (U.S.) and influence from the foreign business ethic is possible through these links.

All four of the variables involved in the determination of industrial structure can be affected by such actions. The power structure, and the economic and competitive environment is constantly changing. As the industry changes, so must the individual company react, or stagnate and perish. In accord-

ance with this it is noticeable that the leading companies of the E.I. have reflected the overall development of the industry, and have invested in the more successful sectors of the industry.

The E.I. continues to be a rapidly expanding industrial sector, contributing heavily to the U.K. export trade, with a highly paid technical staff who are not renowned for industrial disruption. The biggest changes have been witnessed during the 1960's with increased growth and an increased level of industrial rationalisation including greater merger activity and higher levels of concentration of net assets. The average firm size is still rising but not as quickly as the overall industrial average, which would suggest that whilst extra large scale is still important, it is no longer a prerequisite of good performance over and above the national average. The expansion of the electronics and instrument sectors is probably one of the major reasons for this, as the efficient production of heavy duty electrical machinery and associated products is generally associated with large scale techniques. This is witnessed by the fact that throughout the period, by far the largest number of the biggest firms in the industry are of the General Electrical Engineering Type.

This rationalisation is a response to modern trends apparent in all industrial sectors; the shortage of cheap capital, high labour costs, problems of currency and inflation hardly exhaust the list. D.F.I. entry and the government supported theory of "countervailing power" are two other underlying reasons. This latter, aggressive policy, is most clearly seen in the field of computers and micro-electronics, where for strategic reasons the U.K. wants to retain a viable and inde-

pendent domestic industry. To this end, financial backing by the late industrial reorganisation corporation (I.R.C.) was given in 1967/8 to the formation of I.C.L.. The same policy can be seen behind the B.M.C./Leyland merger, the rationalisation of the aircraft industry, and measures taken during the 'Buy British' campaign of recent years. Through such institutions as the National Research and Development Corporation, the National Computing Centre, and the various Government backed Institutes and Committees, the Government has attempted to strengthen the competitive position of British firms and helped to try and reduce the "technology gap". This policy of "countervailing power" has certainly been more successfully promoted in this country than on the continent, this being partly because in the E.E.C. the reactions to U.S. investment differ widely from country to country, and partly because of Britain's relatively strong position in the industries where most foreign investment lies.

However, according to Servan-Schreiber (1968) the only way for Europe to escape domination from the U.S. is through concentrated scale rationalisation of European industry into larger units; massive government assistance in science-based industries; and for much more money to be spent upon higher education - particularly management studies. If this is to happen we must, therefore, be prepared to see further government directed rationalisation and some possible loss of overall control to the European parliament to retain overall independence from American and Japanese Investment. As Britain continues her European path, she is likely to be involved in more intra-European Corporate alliances, particularly when

the Community's merger rules and tax laws are firmly harmonised. As the internal European Tariff barrier is removed, the foreign investor of non-E.E.C. origin must look for ways around the external E.E.C. trade barriers, and one obvious answer is for the greater exploitation of subsidiaries already operating within the U.K. economy. Therefore, we can expect a two-pronged attack upon our present structure in the E.I., from our own economic development as an E.E.C.-member country, and from the reaction of foreign investors.

2.5. Summary.

In conclusion, the preceding discussion allows us to reiterate several points which represent the main features of the development and present-day standing of the E.I..

2.5.1. The E.I. has experienced rapid growth in Sales, Employment, Net Output and other criteria for the measurement of industrial success, since the first world war. This has led to the increasing importance of the industry within the U.K. economy most noticeably in the two decades 1955-1976.

2.5.2. The E.I. contributes the most rapidly increasing Net Output in the U.K. economy of any industrial sector since the second world war. (Although this lead has been reduced in the 1970's)

2.5.3. During this time the emphasis of the E.I. has shifted from the Heavy Electrical Engineering sector, to the high growth and advanced technology of Electronics.

2.5.4. A larger and larger share of this growth has been sponsored by a constantly worsening trade balance, especially in the Electronics sector.

2.5.5. The industry has become more capital intensive with the major impetus for such a trend originating with the Electronics sector.

2.5.6. Expenditure upon R.&D. has increased considerably until the E.I. now accounts for over 25%

of all such expenditure in the U.K. (capital and current).

2.5.7. Sales concentration has increased in all the minimum-list-headings of the E.I..

2.5.8. The E.I. has a highly paid workforce by domestic standards, but these employees are poorly remunerated in the international context. This low level of pay, along with the large available consumer market has encouraged the growth of assembly line production techniques, with the increasing tendency for the importation of the necessary components.

2.5.9. The U.K. is the fourth largest producer of Electrical and Instrument Engineering products behind the U.S., Japan and West Germany.

2.5.10. The 1967 devaluation helped the expansion of the E.I. in the international field, however, inefficient use of labour and a lack of capital investment has led to the increase in output per man being the second lowest of all the industrial nations.

2.5.11. Large scale rationalisation of the industry's product mix, and changes in the relative standing of the larger companies involved, would lead us to expect some significant change in industrial structure.

CHAPTER 3.

THE CHANGING STRUCTURE OF THE ELECTRICAL AND INSTRUMENT ENGINEERING INDUSTRY.

The evidence from Chapter 2 suggested that pressures for structural change exist throughout the industry, so now attention is focused on the possible identification and measurement of such changes in the E.I..

This chapter has a two-fold purpose. Firstly to introduce in detail the model upon which the analysis will proceed and its underlying assumptions and hypotheses. Secondly, to present those changes which have occurred in the structure of the industry since the second world war. An attempt is made to construct a simpler, more straightforward approach to the modelling of industrial structure, and to identify three stages at which D.F.I. can affect the structure of an industry. Finally, new data are presented, concerning the changing structure of the E.I..

3.1. The Model of Industrial Structure.

3.1.1. The Concept of Industrial Structure.

From the outline of previous works presented in Chapter 1 of this study, and their attempted definitions of the term 'industrial structure', it can be concluded that whilst a priori approaches have been detailed in their coverage, they have tended to display a common failing of merely listing the

possible measures of structure available, with little regard for their interrelationship. At the other extreme, there are many empirical studies which seek to quantify the interaction of various yardsticks of structural change. These usually fail either by their very lack of a general approach and little appreciation of other causal factors, often making ceteris paribus, closed model assumptions which are not applicable to the real world; or having found a reasonable methodology, do not cover the full spectrum of the variables interacting to influence industrial structure.

In general, these many structural definitions can be usefully simplified into a basic four variable definition.

(i) The relative size of the industry. (Productive Capacity)

(ii) The distribution of market power. (Concentration)

(iii) The closeness of the industry's production around its definitive industrial product and process structure. (Product and Process Structure)

(iv) The industry's ability to protect its autonomy. (Entry Barriers)

These will be directly related to the behaviour of the companies within an industry and these four variables are therefore referred to as the 'primary behavioural variables'.

The term 'industrial structure' contains two basic assumptions. Firstly, that a certain group of companies exhibit some relationship that can be called an industrial grouping. This is quantifiable by examining the closeness of these companies to their industrial product base, and their role as a cohesive unit within the economy. Secondly, that in forming such a group the companies involved do so in such a manner

as to display a structured relationship, and this can be defined as their method of sharing and protecting the market power they create as an autonomous economic unit.

Having defined industrial structure thus, a framework exists upon which to hang the methods of measurement to be used. This is convenient because one of the main drawbacks in many studies has been the proliferation of quantitative techniques with little unifying definition.

(i) Productive Capacity

Earlier writer have sought to define various measurements of the size of an industrial sector. However, numbers of establishments, numbers of employees, net output, net asset worth, and so on, all have inherent pitfalls.

Knowing the number of establishments in an industry means nothing unless we link it to their size distribution, and numbers of employees again means little without knowing something about the labour intensiveness of the industry. Net output, whilst roughly measuring value added to the economy by an industrial sector, also includes an efficiency qualification. The difference between gross and net output is a measure of inputs consumed and as efficiencies vary between companies and industries, then this will affect the accuracy of the measurement as a yardstick of size. Use of net asset worth presents the same problems. Therefore here a much simpler variable is used; the proportion of the U.K. sales of goods and services accounted for by the companies within the E.I..

This too has a defect in most usages, namely that it

says nothing of the input/output ratio which obviously will affect the true worth of any contribution to the economy. However, concern here is not with efficiency, (a much more sophisticated system of measurement for efficiency will be employed later) but only with industrial power as measured by scale. The true impact of the growth of an industry only becomes felt once production ability and market dominance are translated into sales revenue.

In their note, G.D. Newbould and K.W. Wilson (1977) demonstrated significant correlations between the use of Sales, Capital Employed, and Net Profit in measuring company size. This would indicate that Sales is as acceptable a yardstick as the other major methods. They also suggested that these three variables had more general applicability than other techniques such as the number of employees and measures of net cash flow.

(ii) The Distribution of Market Power.

Whereas in the first case interest was purely in the measurement of some scale of size, here a more qualitative conclusion will eventually be involved, as market power implies something more than market share. Therefore three methods of quantification are used to eliminate any element of bias inherent in any single approach.

Firstly, the distribution of employment throughout the E.I. is examined to obtain some measure of the size range of companies in the industry. This is viable, given the fact that the firms to be included are now solely from the E.I. and one element of industry power could be taken as the per-

centage of available labour input controlled by a particular size group of companies.

Secondly, a 10 firm concentration ratio of net asset worth is constructed as a measure of the distribution of capital employed within the imperfectly competitive market situation facing the industry's largest companies. Thus the control of capital input by such firms is also being measured.

Thirdly, the level of merger activity within the industry is used as a proxy for the level of company inequality in the E.I.. The number of mergers is used rather than any total of net assets merged or output amalgamated because it was thought that these latter values added nothing to the understanding of the situation unless the individual sizes of the companies involved was known and allowances made for the variation in accountancy practices. One would expect, therefore, that a fall in the numbers of mergers represented, if supported by the first two variables, a more equal sharing of market power at least between the largest companies, with no pressure upon them to purchase companies which were not over-attractive, and no pressure upon smaller companies to associate together for protection. i.e. As the most popular vehicle for both aggressive and defensive expansion has historically proved to be the merger or takeover, high levels of such activity can be seen as representing a rapidly changing industrial structure. Meanwhile lower levels of merger activity should reflect a situation of relative structural stability in terms of the distribution of market power. This implies that the effects of merger activity are related to the origin of the acquiring companies, and this is also

considered.

The combination of these three results should enable the overall distribution of firm size to be seen; the percentage concentration of market power in the hands of a few large companies; and the rate at which companies are amalgamating (either larger firms swallowing up smaller firms to enhance growth, or the smaller companies combining in their competition with the industry's bigger enterprises.).

The traditional use of a sales concentration ratio as a measure of the distribution of market power proved impossible, in that data on the percentage of sales turnover of the largest companies actually stemming from transactions accountably of an electrical or instrument origin would have been necessary. The importance of this is demonstrated quite simply. If we add up the total sales of the E.I.'s largest ten companies, then this figure exceeds the total sales of all firms in purely E.I. commodities. To deduct a fixed percentage from such figures would be meaningless, given the widely different operations of the companies. In the light of later data collection, such firms have also proved reticent to supply such information in any meaningful way, so the best alternative was considered to be the above combination of measures.

(iii) Product and Process Structure.

Two measurements are used. The level of diversification and the level of vertical integration. The former is presented by the use of an index, to distinguish what proportion of the industry's sales are in the major product lines of the

companies involved.

$$\text{i.e. } D = 1 - \sum_{i=1}^{n} pi^2$$

where the level of diversification (D) ranges between '0' and +1'. '0' represents zero diversification, whilst'+1' represents infinite diversification and

pi= Industry output in the 'i'th industry

Industry output in 'n' industries.

This represents an approach along the lines of the Herfindahl Summary Index of Industrial Concentration, but here it is applied to a range of industrial activity rather than the distribution of firm sales between competing companies. (Herfindahl 1950). Input/output tables were used to provide data on the proportion of industry sales attributable to the major product lines of the companies involved. This is taken away from 1 to achieve an index which moves in the appropriate direction, (i.e.rises as diversification rises and falls as diversification falls.).

The level of vertical integration is a measure of the percentage of inputs passing between various stages in the process structure, which are supplied by companies under the same ownership as the purchaser. Thus measuring the degree to which companies in the E.I. control their own industrial process structure by ownership. This is measured using the equation below:-

$$\text{i.e. } VI = \frac{\Sigma PO}{\Sigma TP} \times 100$$

where the level of vertical integration (VI) is the sum of the total purchases from companies under the same ownership (PO) expressed as a percentage of the sum of total purchases (TP) from all sources by the same companies.

(iv) The Ability to Protect the Industry from Potential Entrants

Here concern is with the strength of the cohesive element amongst the industry members to protect themselves against new entrants, either from other industrial sectors or from geographically different origins. The main emphasis is placed upon the protection against the establishment of production facilities. In essence, therefore, we are referring to entry barriers, and two such barriers are used here as evidence of difficulty to enter the E.I., alongside one additional variable.

According to the usual classification, barriers to entry may be placed in three categories, namely absolute cost advantages, product differentiation, and scale economy barriers. The second type of barriers as quoted above is based on the idea of brand definition as a barrier to the new entrant, in that it makes it difficult for such a firm to obtain the 'critical mass' market share of its new industry without large scale advertising. However in the E.I. a very large percentage of production is of an intermediary nature, and product differentiation is based more upon technical refinement marketed by technically orientated sales teams and therefore the concept of 'advertising and promotional costs' as a proxy for the level of differentiation is a weak approach.

Direct consumer advertising and its associated products

comprise only a small percentage of total production as was seen in the last chapter, and often a high level of development expenditure could be written off as 'consumer orientation'. Therefore it is difficult to decide upon just how one would define product differentiation costs. Finally the intermediary nature of the bulk of production often means that whilst established suppliers of specialised components need to spend little time and effort upon product differentiation the product is indeed very highly differentiated. This state of affairs would not be reflected in any recognised proxy variable however. This was supported by a ranking of advertising -sales ratios for the industries of the U.K.. The E.I. lay 7th. out of a list of all such sectors, yet the domestic electrical goods specialism of the industry spends very large amounts upon genuine consumer advertising. This would suggest bias in the presentation of any such data as being representative of the level of product differentiation in the E.I.. Therefore this traditional measure of entry barriers is not included.

The two measures of entry barrier used are, firstly research and development costs as a proxy for the overhead costs of production encountered in the E.I.. The nature of the connection between industrial structure and innovation has been the subject of a great deal of discussion. Much theorising, and more recently, empirical work has been devoted to examining the relative importance of the degree of market power and the absolute size of firms in determining the extent of innovatory effort. One school of thought has been designated a 'competitive pressure' school, which it is alledged holds

that in an atomistically competitive situation, with its powerful tendency towards a uniform 'normal' rate of profit, there will be strong pressures making for cost reducing innovations. Therefore, the level of R.&D. will be inversely related to company size, in that as increased size and market power are experienced, the innovatory pressure reduces.

Conversely, the 'monopoly profit' school believe that since innovation is risky, the protective cocoon of monopoly profit must exist before sizeable R.& D. expenditures will be incurred. Hence the level of R.& D. is directly related to size and market power. If we assume that some degree of absolute size is required before meaningful R.& D. facilities can be provided within the firm, then both seemingly conflicting viewpoints can be reconciled into a 'neo-Schumpeterian' hypothesis, as summarised by Markham:-

> "the greater the profits and the degree of market power (the potential capability to earn monopoly rewards) or firm size, the greater should be the effort of innovation."

This has been supported by many of the earlier writers on this subject, and it seems plausible to assume that R.&D. expenditures can be used as a proxy for the existence of absolute cost barriers to entry. (See for example, Markham 1965 and Devine et. al. 1974, which are both excellent surveys of the empirical work in this field. Also Schumpeter 1954, Hamberg 1964, Scherer 1965, Freeman 1965.).

Secondly, the labour productivity of the largest companies of the industry are compared with that of the smaller

firms as a measure of economies of scale. Finally a third variable is added. Again using merger activity, this time the value of mergers between companies both classified as electrical or instrument engineers are shown as a ratio of those mergers between E.I. companies, and firms from other industrial sectors. This should give some indication of the ability of the companies of the E.I. to protect and expand their market share by purchasing likely companies within their own industry, rather than allowing other sectors to diversify into the E.I.. This measure also shows the degree to which industrial rationalisation is 'kept within the family'.

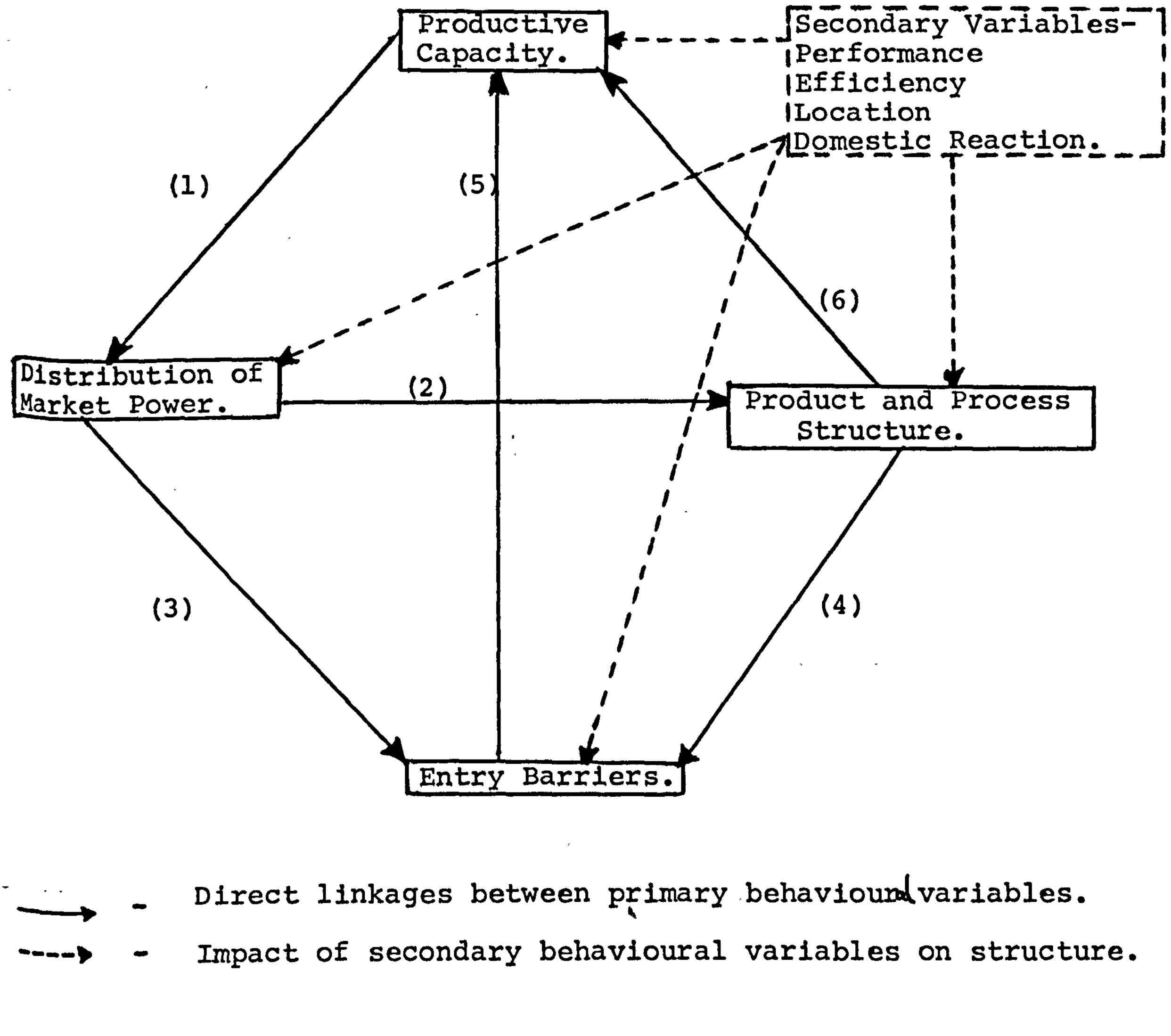
3.1.2. The Model.

The overall picture can be seen more clearly with the aid of the schematic diagram presented below. Existing evidence supporting the interrelationships demonstrated above was largely presented in the introduction, and what material remains will be introduced in the relevant chapter, holding other empirical evidence, where available, alongside our own findings for purposes of comparison. However, it will be useful to introduce the *a priori* reasoning upon which the model is based, and make reference to the sources of supporting evidence. Finally, a series of rank order correlation coefficients calculated for all U.K. industry demonstrate the relationship between the above variables.

The continuous (numbered) black lines show the interrelationships which exist between the variables comprising the definition of industrial structure. They can be summarised

FIG. 3.1.

Schematic Diagram of the Association between the Primary and Secondary Behavioural Variables comprising Industrial Structure.



→ - Direct linkages between primary behavioural variables.

⇢ - Impact of secondary behavioural variables on structure.

Numbers (1) to (6) refer to bibliographical references as described in the text.

Source; Author's own construction.

briefly.

(1) The level of productive capacity is one determinant of the distribution of market power within an industry. Rapid growth of productive capacity is likely to weaken the imperfection of competition and the degree of concentration. (For example see Phlips 1971; Scherer1970; Kamerschen 1973).

(2) Changes in the distribution of market power will affect the company's ability to diversify their product mix and integrate their process structure vertically, in that a solid share of the definitive market allows movement into new fields with the greater risks involved. Indeed, this may well be the only avenue of expansion left in the face of high concentration of production within the companies original market. (For example see Scherer 1970; Penrose 1959a; Weston 1973).

(3) The distribution of market power will also affect the industry's ability to maintain effective barriers to entry. The scale of operations and the degree of market imperfection as determined by the market shares of the major companies, will determine their ability to exploit economies of scale, overcome high setup costs, and absorb greater levels of overhead costs of production. (For example see Guth 1973; Mann 1973; Bain 1956).

(4) Entry barriers can also be created by high levels of product differentiation, and sub-optimal pricing policies, both of which will be greatly facilitated by high degrees of vertical and horizontal integration. (For example see Bain 1956 and1959; Taber 1965; Comanor and Wilson 1973a(b).

(5) Entry barriers themselves affect the ability of potential entrants to gain access to the market and thereby

will help control the growth of productive capacity of the industry. (For example see Bain 1959; Mann 1973).

(6) Finally, the range of products produced, and the level of vertical integration will affect the percentage of potential productive capacity which is actually used to produce sales capacity, and also the wider the range of markets serviced, with greater efficiency brought about by vertically integrated process structures, will have an impact on the structure through affecting the speed of growth of sales. (For example see Baumol 1967; Berry 1973).

D.F.I. is the means by which the foreign affiliate becomes part of this system. The presence of foreign affiliates has a double effect. Firstly they affect structure by locating in the most rapidly changing areas of the economy and the E.I.. Secondly they operate in such a way as to exaggerate the change. This might be summarised as a Destination and Behavioural effect.

The destination effect comprises what we have termed the economy and industry level pressures for structural change, and the behavioural aspect is the firm level effect. This latter, operating stage can in turn be broken down into the two further stages of impact presented above, differentiated by the immediacy of reaction by structure to pressures for change. Namely a primary behavioural impact and secondary behavioural impact.

The primary behavioural impact is the effect of foreign owned subsidiaries upon the industrial structure of the E.I. initiated by their original entry and operating procedures, including the product and process structures developed. Time

is not used to differentiate between this and the secondary behavioural impact, as is often the case with previous studies, but the whole process is seen as one of continual modification. New entrants are merely part of a continually dynamic process combining with trends already developed by existing foreign participants.

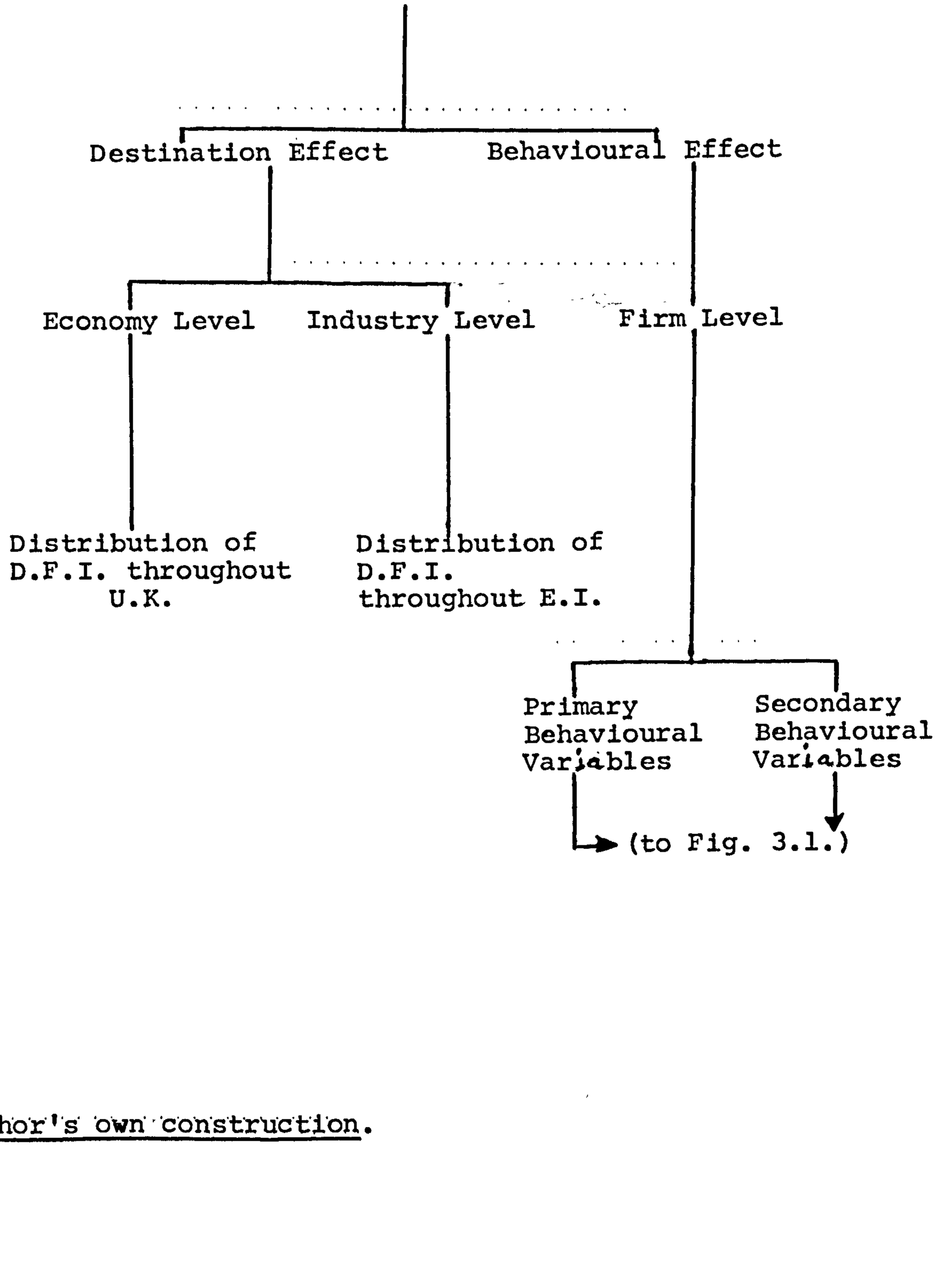
Therefore the size of productive capacity, the distribution of market power, the product and process structure, and the reinforcement or weakening of entry barriers, will directly introduce changes in industrial structure. However, other aspects of the foreign affiliates' operations will also bring about pressures for change, but indirectly. For example, differing efficiencies, geographical locations, or collusive reactions by the domestically owned companies and/or government, will also bring pressures to bear on the existing structure via an impact upon one of the primary endogenous variables. This pressure may be lagged or immediate, but it is of an indirect nature, working through the four points of measurement which comprise the definition of structure. These secondary variables are considered in Chapter 6.

The final model can now be summarised schematically, based upon the chapter thus far. (Figure 3.2.).

Foreign affiliates will make a contribution to the productive capacity of an industry. The nature of this contribution will be dependent upon the initial entry, whether it be by green field venture of acquisition. Assumptions have to be made concerning the alternative to D.F.I. and what would have happened in the absence of such investment. Finally, the location of affiliates within the minimum-list-headings of the

FIG. 3.2.

Schematic Diagram of the Impact of D.F.I. upon Industrial Structure.



Source; Author's own construction.

E.I., and the competitive efficiency of the individual company will determine its rate of growth of sales revenue, and ultimately its value to the industry's productive capacity.

The affiliate's entry also has an effect on the distribution of market power, dependent upon the size of the individual affiliate, the structure of the parent company, and the autonomy of the other affiliates with which the company is competitively concerned. This will determine the level of power which the affiliate can concentrate in the one market.

The product and process structure will be modified by the foreign presence if the affiliate exhibits an obviously differing product mix and process structure to those already present. This is indeed likely, given that most affiliates are specialised units within diversified and highly vertically integrated multinationals.

Finally, the affiliate will affect the level of entry barriers by its operations if overheads such as R&D are perceptively higher or lower than the indigenous sector. The same result could be expected by any extensive exploitation of economies of scale, high levels of product differentiation and high set up costs. Transfer pricing also allows sub-optimal pricing techniques to undercut potential rivals. Here the effect is two-way, in that the level of entry barriers will in turn help to determine the attraction of the industry for potential future foreign entrants.

These effects work in an immediate fashion, but will also be accelerated as they work within the system of interrelationships between the variables shown in Figure 3.1.. i.e. the foreign entrants affect on the distribution of market

power, for example, comes directly from its own size, and secondly via its effect upon the level of productive capacity. Indeed, these could tend to work in opposite directions. One could imagine the situation where a company of large size would add to the concentration of market power in the hands of the larger corporations, whilst at the same time its addition to the level of productive capacity and very operating presence would tend to reduce the dominance of the larger firms already present, and therefore be said to reduce the previously existing level of imperfection.

However, there is also the indirect, secondary impact as shown by the dotted lines. The entry of the foreign company initiates changes in a series of secondary variables as shown in the box surrounded by the broken black line. These in turn will have some bearing upon the changing nature of the four definitive primary variables. These factors are considered to be secondary to the main variables only in the immediacy of response of industrial structure to their effect. For example, the level of efficiency of companies within the E.I. is not considered to have a direct impact upon the industry's structure, but obviously such a factor will be instrumental in shaping the operating behaviour of the companies involved, and be important in the final determination of the industry's growth and structure.

It follows, therefore, that if foreign companies are more efficient, with better performance and location decisions, then this will effect the level of productive capacity in that these companies will grow more rapidly than the indigenous sector. This will also affect the distribution of market power as they

obtain greater shares of the market. Product and process structure will be altered by diversification and vertical integration as vehicles for growth, and influenced by the acquisition method of expansion being used to exploit new markets. Changes such as these will tend to alter the level of entry barriers as the degrees of product differentation, overheads and setup costs, and economies of scale are changed.

A domestic reaction could also be triggered off, and the behaviour of indigenous companies and the host government coupled with the economy's economic institutions, could modify the industrial structure as they react to the foreign entrant. One good example of this is the creation of I.C.L., another would be the I.R.C.'s sponsorship of the G.E.C./A.E.I./English Electric merger, both of which severely rationalised their respective industries in the light of foreign competition.

This all assumes that the operations of foreign affiliates are in some way different to what would have taken place in their absence. Indeed it often assumes that a void existed which they have filled. This 'alternative position' assumption is examined in detail later, but for the purpose of this study it is assumed that any void left by the absence of foreign companies would be taken by British firms who would operate in a manner consistent with the characteristics of firms already present in the industry, and the variations in performance and behavioural characteristics between the two groups of companies are taken to be the origin of foreign impact. To this end the analysis will subdivide the industry into six headings; affiliates of U.S. parents, affiliates of E.E.C. parents, affiliates of other foreign parents, affiliates

of large British companies, affiliates of small British companies, and unattached independent U.K. firms. This enables not only examination of the differential performance of U.K. to foreign affiliates, but also to determine the precise origin of the major differentials - be it from the variation in size of indigenous operations or from the geographical origin of the affiliate.

Recent thinking in this field has suggested that both market servicing by exports and licensing have an impact upon the host country economy and that foreign penetration should be measured, therefore, by exports of foreign competitors plus licensing of foreign production in the host country plus D.F.I.. This study, however, concerns itself solely, with the latter. There are several reasons for this.

Firstly, our main concern here is with the impact of foreign penetration upon industrial structure, and the biggest single influence in this area in the foreign servicing of U.K. markets, is the development of the M.N.C.. Secondly, the flow of exports can be analysed and understood by existing trade theories, and controlled by national governments. This is not always so clear a situation when the U.K. industry is faced by the entry of foreign affiliates. Thirdly, licensing is a major influence upon the U.K. electronics market, but the major problem is often one of controlling U.K. patents abroad, not the undermining of the U.K. industry by the lack of research effort in this country. The problem facing domestic producers is one of development not a lack of original innovating ideas. Fourthly, only in particular fields such as active and passive components, and electronic computers

is the import trade even remotely comparable with the level of market servicing provided by foreign penetration via D.F.I.. Fifthly, the development of the Japanese electrical and instrument engineering industry has coincided with a relaxation of the Japanese overseas investment restrictions, the declining value of the yen, and the Japanese/U.S. agreement on a volume export ceiling. This has led to a sudden breakout by the Japanese manufacturer into production facilities abroad (especially into Europe), and hardly a month passes without the announcement by a Japanese electronics firm of a new overseas sales or manufacturing subsidiary, or the expansion of existing overseas facilities.

Already these companies are moving into areas of forcasted consumer demand in the 1980's. The initial boom of D.F.I. expansion may slacken, and for some time to come a combination of marketing agreements and licensing may be used to win and increase overseas market shares, however, the trend would appear to be towards an increase in the role of Japanese M.N.C.'s in the international trade market and the replacement of exports by overseas production as the major means of market servicing. Finally, following the theory of Buckley and Casson (1976) where internalisation of market knowledge is a primary motivator in the formation of M.N.C.'s, it is only to be expected that in high technology fields the strongest pressures are felt by overseas parents to service the host market by overseas production facilities. This is supported by many writers who show that D.F.I. is indeed most attracted to areas of high technology (see for

example Dunning 1966 and 1970b; Buckley and Casson 1976).

Therefore this study suggests that in the foreseeable future in high technology industries like the E.I., the major impact of foreign penetration will be felt via the medium of the M.N.C. and its affiliates. This study concentrates on such phenomina particularly because the field is still very much devoid of empirical evidence.

Firstly, it is possible to support the interactions between the four primary variables as demonstrated in Figure 3.1. by the use of Spearman Rank Correlation Coefficients, calculated for the industrial manufacturing sectors of the U.K.. (This simply provides evidence of an association, however, we find no reason to disbelieve the findings of the writers who profess to demonstrate causal links. See Section 3.1.2..) As some of the structural variables consist of more than one source of measurement, the full list of interrelationships is complex, thus the results are presented in matrix form in Table 3.1.. This method of ranked correlation analysis shows results ranging from -1 to +1. No association between two sets of ranks is indicated by a coefficient of zero, a perfect relationship by a coefficient of unity, and an exactly inverse correlation by a coefficient of -1.

The results suggest strong relationships between the variables presented in Figure 3.1.. These variables are broken down into their quantifiable characteristics, and correlations constructed only fail to register a significant relationship in one major area. That is in the use of advertising costs/sales turnover as a proxy for the level of product differentiation.

TABLE 3.1.

Spearman Rank Correlation Coefficients of the Associations between the operating characteristics of the Primary Behavioural Variables comprising Industrial Structure and D.F.I.

	Productive Capacity	Dist. of Market Power	Product & Process Structure Div.	Product & Process Structure V.Int.	D.F.I.
Productive Capacity	-	0.68*	0.59**	0.58**	0.67*
Distribution of Market Power	-	-	0.60**	0.57**	0.76*
Product & Process Structure;					
of which;					
Diversification.	-	-	-	-	0.74*
Vertical Integration.	-	-	-	-	0.66*
Entry Barriers;					
of which;					
Absolute Cost.	0.77*	0.71*	0.76*	0.69*	0.93*
Economies of Scale.	0.65*	0.52**	0.66*	0.71*	0.71*
Product Differentiation.	n.s.	n.s.	n.s.	n.s.	n.s.

*Significant at 1% level. **Significant at 5% level.

N.S. not significant.

Source; Calculated from Report on the Census of Production 1968 H.M.S.O.

It has already been suggested that such a relationship is untenable for industries similar to the E.I., and so, as we might expect, this variable shows no correlation with either of the other two proxies for the level of entry barriers of absolute costs of entry and the existence of prohibitive economies of scale.

The results also allow us to distinguish those industrial characteristics which are directly related to foreign penetration by the method of D.F.I.. The coefficients identified were significant at the 1% level for all areas of industrial structure, showing a distinct relationship between the two.

Although the statistical analysis must be interpreted with caution, it does suggest that the variables presented earlier schematically represent an acceptable picture of the interaction of industrial structural characteristics, and their contribution to the overall concept of structure as previously defined. Also they support the hypothesis that foreign investment has a role to play in the changing structure of the E.I., and industries in general.

This then is the way in which the impact of foreign subsidiaries can be measured. Figure 3.2. demonstrated that this final, quantifiable impact stems from three levels of pressure for structural change within the E.I., at an Economy, Industry and Firm level. However this was not shown diagrammatically in Figure 3.1.. There are two reasons for this suppression. Firstly it was thought further complication of the diagram would only lead to confusion by a proliferation of lines and boxes. Secondly, no matter at which level of pressure the change in structure is initiated, it can only be witnessed at

one point, namely the point of measurement. Figure 3.1. only shows the measurable relationships. For example, productive capacity can be affected by the foreign affiliate directly at three levels.

Firstly, the foreign company is attracted to the E.I. and this will be represented in the growth of the industry relative to other industrial sectors. Secondly, the foreign affiliated firm may be attracted to growth areas of the E.I. and help accelerate the expansion of productive capacity by such a move into the more rapidly expanding and successful minimum-list-headings. Finally, the company may be more efficient and grow more rapidly than the indigenous firms even within the same environment, thus adding disproportionately to the growth of productive capacity of the industry. This could also have spinoff effects and initiate a domestic reaction which would lead to increases production from the indigenous sector in a drive for a more aggressive posture. However, all of this only leads to one measureable change in industrial structure, an increase in the level of productive capacity. The routes by which this happens may be identifiable, but quantification of the individual stages to determine their contribution to the final measurement is too highly subjective. Such figures would rely on a variety of alternative position assumptions concerning the likelihood of foreign investment locating in other countries; other industries than the E.I.; a different distribution of D.F.I. within the E.I., and what would have replaced it and to what degree of success. Also the necessary data is not forthcoming from the companies involved.

Therefore the study will merely witness the existence of

such pressures, and seek to highlight the coincidental occurrence of a changing industrial structure and the presence of D.F.I., attempting to analyse the nature of the foreign impact at each of these three levels. It is only at the final, firm level which the overall impact will be quantified with any direct statistical causality being suggested.

This does not jeopardise the validity of points made in Chapter 4 in which an attempt is made to support the view that Economy and Industry level effects of D.F.I. exist. The a priori reasoning behind the belief that such a relationship exists must, however, be introduced first.

3.1.3 Pressures for Structural Change and the Role of D.F.I..

There is evidence to suggest that three stages of pressure for structural change are operating in the E.I.. Firstly, pressure resulting from an overall change in the balance of the U.K. economy which leads to changes in the relative standing of the various industries (Economy - level); secondly, a pressure for change within the E.I. itself resulting from the changing development of the minimum-list-headings (Industry - level); and finally there exists a basic micro imbalance of operating performance and behavioural reactions to competition between companies even in the same field (Firm - level).

At an economy level the changing structure of the E.I. and its surrounding U.K. economy as a whole will lead to pressures upon the structure of the E.I. as a part of that economy. The differential attraction of the component industries for D.F.I. can be seen as one of the dynamic variables.

Within the E.I. itself, the rapid expansion of

some sub-headings with the relative decline in the importance of others will lead to a second source of pressure. Again the distribution of foreign affiliates throughout these sectors, and their differing degrees of participation can be seen as one of the determining factors.

Finally, the face to face performance of the individual companies, and the interaction of indigenous and foreign owned firms, will be the most important determinant of the final structure of any industry. It is in the operations of these firms that a point of measurement can be constructed for the total effect of foreign investment on industrial structure. This is determined by the final competitive relationship of the industry's companies, both indigenous and foreign owned, and the domestic reaction of the former (and the host government) to the latter.

This section will be looking at the theory underlying the hypothesis that there exist three origins of pressure for structural change in an industry which can be influenced by the presence of D.F.I..

(i) The Economy Level.

As an industrial nation develops, it is inevitable that the range of manufactured goods will vary in response to the changing world with its changing needs and the development of new production techniques. This will necessitate a continual state of flux in the various sectors of the economy, with older declining industries being replaced by the newer, emergent ones. This will be all the more true of those industries at the forefront of technology, innovation and changing fashions. The

E.I. can be seen to be one such industry, and since the second world war the U.K. has experienced (along with the remainder of the developed world) an era of growing technological dominance, which has been reflected in the rapid expansion of industries such as the E.I..

In the past this industry has owed much to the presence of individual entrepreneurs, of which Marconi and Ferranti are notable examples. Inventors who moved into production to exploit their own discoveries. The General Electric Company was founded by an engineer trained in the early electricity generation, whilst Morphy-Richards originally saw its founders producing electric fires in an old barn.

The most modern branch of this industry, electronics, was also pioneered to a considerable extent by individual inventors and small firms. However, this initial success in all sectors of the E.I. soon attracted established companies from peripheral industries, and one of the easiest forms of obtaining sufficient specialist techniques was by acquisition of companies already operating in the field. So in 1924, N.V. Philips acquired interest in Mullards; and G.E.C., British Thompson Houston, Cossor's and English Electric are only a few of the initial purchasers of specialist manufacturers of electrical products.

So the nature of the development of the E.I. at an early stage, laid down the pattern of structural rationalisation that has become a continual process for the industry. Evidence to support these suppositions has already been presented and such material as shown in Chapter 2 suggests that this is certainly an 'industry of the modern age'. There is every

reason to expect that nucleonics or some still further advanced sector will eventually make obsolete a large proportion of the market for electrical goods, and the E.I. as it stands now will either have to adapt or become in its turn, a declining sector. However, for the present, resources are flowing into the industry, often at the expense of other parts of the economy. Such is industrial evolution.

Comment has already been made regarding the E.I.'s increasing importance to the U.K. economy, and it is certainly the fastest growing sector by all the usual measures of industrial expansion. This rapid rate of expansion, when coupled with the continually increasing rationalisation of the industry by the amalgamation of companies operating within its boundaries, must lead to a pressure for change in the industrial structure of the E.I.. It could be hypothesised, therefore, that the productive capacity has risen rapidly, with a shift in the distribution of market power, greater specialisation and integration between the acquired companies, and the ability of firms to raise further entry barriers against potential entrants. This is exactly what this chapter will be attempting to show. This study would further hypothesise that one major factor operating at this level is the influx of foreign investment which is more than proportionately attracted to this industry. (For a summary of testable hypotheses see section 3.1.4..)

At an economy level, if D.F.I. is attracted to the E.I. in above average amounts, and in doing so adds to the growing importance of this industry, then it could be concluded that the presence of foreign affiliates has aided the differential

development of the E.I. within the U.K. economy. This will lead to a pressure for structural change upon the individual industries, including the E.I.. Evidence is presented in Chapter 4.

(ii) The Industry Level.

Just as the imbalance between the different industries of the U.K. and the changing nature of their interrelationship within the economy brings about a pressure for structural modification, so too a relative imbalance and a change in the relative standing of the minimum-list-headings of the E.I., has some effect upon the structure of the industry.

This is based on the assumption that different sectors of the E.I. exhibit different structural traits, and a movement in their relative importance to the E.I. will initiate some noticeable alteration in the overall structure of the industry. Thus in these first two areas of change, modification can be brought about merely by movements in the general pattern of industrial production.

Previous writers have argued that the foreign affiliate performs better than its British counterpart equally in all sectors of the U.K. economy, and that in doing so seems to possess a keener ability to operate more efficiently within its given environment than the British owned company. (For example, Dunning 1966 and 1970a;Hymer 1960; Vernon 1966; Caves 1971; Johnson 1970). This would lead us to the conclusion that the foreign participant is adapting to, and helping to mould, the structure of the industry more actively than the domestic sector. One alternative is important to the present

discussion. It could be that foreign affiliates merely locate in the more profitable and rapidly growing areas of each individual industry, rather than outperforming indigenous companies in every field. If this is so, then they are helping to stimulate our second source of pressure for change in yet another manner. They are accelerating the trend for growth and success in certain sub-headings of the E.I., and shunning those areas of declining fortunes.

Evidence has already been produced to show that the structure of the E.I. as defined earlier is indeed changing, and the relative contribution of the industry's minimum-list-headings is also changing both in terms of their importance to the whole and their resulting product mix. Obviously such differentials will lead to reactions by companies in modifying their operations to match the environment and the changing needs of their particular sector. These refinements to policy modify the structure of the minimum-list-headings, and as they do so, will affect the overall balance. Thus changes in one field will affect the overall industry and place pressures upon other sectors in a continual cycle of action and reaction. A good example of this can be seen in the computer industry. I.C.L. was created to compete with the American dominance in the computer market, drawing resources from companies involved in other sectors of the E.I., and their operations in several of these areas would need modification to enable the smooth running of their computer subsidiary. Thus the structure changed in two ways. The intervention of these companies in the field of computers diversified their operations, whilst

a secondary effect occurred in fields with little or no direct connection with computers, and those subsidiaries in peripheral areas of activity would become more integrated with the computer industry.

Given these variations in the minimum-list-headings of the E.I. it will be interesting to note the investment decisions of foreign parents, and the destination of D.F.I. within the industry.

(iii) The Firm Level.

This final, or firm level effect, stems from the day-to-day, face-to-face, operations of individual companies within the industry. The first two pressures for change come purely from the movements, and expansion, of companies in firstly the economy as a whole, and secondly within the minimum-list-headings of the E.I.. This latter pressure originates from the differential operating methodology of the component companies. Here the major determinant of the final effect will be the degree to which individual companies act in such a way as to be continually modifying the industrial structure. In quantifying these effects, the difference between the operations of foreign owned firms and those under domestic parentage, and also the differing approaches of the groups comprising the foreign sector, will be measured to identify the effect of D.F.I. upon the final structure.

Obviously the degree to which variations in operations are discovered will affect the two earlier pressures for change, in that, if foreign affiliates are widely different from the indigenous firms in their effect, then their concentration in

certain of the E.I.'s constituent fields of activity, and in the E.I. as opposed to other industries, will be exaggerated.

3.1.4. The Hypotheses: A Summary.

The model being used to measure the impact generates six major hypotheses, which the study will examine. These are summarised below.

Hypothesis I.- This proposes that there are significant changes taking place in the industrial structure of the E.I.. These changes have been present since the second world war, and have accelerated during the past decade and a half. This change has significantly modified the posture of the industry, altered its product base and affected its development within the U.K. economy.

H.1. There has been a significant change in the industrial structure of the E.I..

Hypothesis II.- The four primary behavioural variables of industrial structure, as defined above, can be used to obtain an exact measurement of the nature of this change, and can quantify its exact extent by relating the results to the remainder of the U.K. industrial sectors.

H.2. This structural shift can be understood in terms of a change in any one of, or combination of, four primary behavioural variables comprising the definition of industrial structure as presented earlier in this study.

Hypothesis III. - A series of secondary behavioural variables such as location, efficiency and domestic reaction, can be seen to influence the final structure indirectly.

H.3. Secondary behavioural variables can be isolated, and will have an indirect impact upon the industrial structure.

Hypothesis IV.- Any results obtained from H.1., H.2., and H.3., can be explained by a three-fold pressure for structural change operating at an economy, industry, and firm-levels.

H.4. These changes have been instigated at three levels of structural pressure.

Hypothesis V.- The presence of large numbers of foreign owned affiliates, when in direct competition with British owned, companies, have been instrumental in accelerating the change in structure of the E.I.. This effect can be seen in terms of the variables noted earlier, and at each of the three levels of pressure for change noted in H.4.. Also, the effect can be segregated by ownership, as affiliates of differing national parentage do not all exhibit the same behavioural traits.

H.5. Each of the above hypotheses can be related to the presence of foreign affiliates in the E.I.

H.5(a) This effect differs according to the national origin of the affiliate.

The remainder of this chapter is devoted to an examination of the changes which have taken place as specified in hypotheses I and II. Chapter 4 is concerned with the determination of the validity of hypothesis IV, whilst Chapters 5 and 6 are concerned with the three remaining hypotheses.

3.2. The Changing Industrial Structure of the E.I.

In Chapter 2 the rapid development of the industry within the U.K. economy was demonstrated, as was the shifting of emphasis across its major areas of production, and some change in the product mix of the output of the individual sectors.

Attention is now focussed on the overall modification of industrial structure since the second world war, and without as yet apportioning any responsibility, an attempt is made to show this change in the context of the previous chapter's findings. Each of the structural variables is introduced in turn and any changes highlighted and examined. These separate results are compiled into a more complete picture of this aspect of the industry and related to its surrounding environment.

3.2.1. Industry Size. (Productive Capacity).

In Table 2.5 the relative growth of the sales turnover of the E.I. was shown as compared with other major industrial sectors of the U.K. from 1948-76. Table 3.2. expands these results, and data are presented on the size of the E.I.'s productive capacity (sales) expressed as a percentage of total industry sales.

TABLE 3.2.

The Size of the E.I.'s Productive Capacity : Sales 1935-74.

Date.	E.I. £m.	All U.K. Industry £m.	(%) E.I. Sales / All U.K. x100
1935	124.0	3,542.7	3.50
1948	563.3	12,002.9	4.69
1951	801.9	18,032.8	4.45
1954	1,021.7	20,880.0	4.89
1958	1,452.7	26,798.0	5.42
1963	2,241.2	34,317.0	6.53
1968	3,240.3	47,761.0	6.78
1971	4,558.3	54,254.0	8.40
1974	6,237.2	57,165.7	10.91

The latest estimates for 1975/6 still show too many omissions for the data to be considered accurate.

Source: Report on the Census of Production (Various Issues) H.M.S.O.

Business Monitor Series (Various Issues) H.M.S.O.

It can be seen from the table above that the E.I. has steadily increased its share of the production of U.K. goods and services, sold either domestically, or destined for export abroad. Growing as it has, at an average annual rate of 16.5% this sector compares more than favourably with the 10.7% rate achieved by the U.K. as a whole. Thus the E.I. now (1974) accounts for 10.91% of such sales, compared with 5.42% at the end of the 1950's, and 3.50% immediately prior to the second world war. This confirms the earlier opinion, expressed in Chapter 2, that this sector represents one of the fastest growing industries in the U.K., and that this trend has increased markedly throughout the 1960's and 1970's.

To emphasise these results, a comparison of the E.I. with other major industrial manufacturing sectors shows that no other industry has expanded sales turnover faster than the E.I. during the period, and that this is even more evident when examining the figures for the 1960-1974 period in isolation. Support also comes from the index of output (at factor cost) as shown in the National Income and Expenditure Accounts, where again the E.I. outperforms every major industrial sector.

It would appear, therefore, that the industry has experienced a far above average growth rate since the second world war, and particularly during the fifteen years leading up to 1974. It can be stated, categorically, that the E.I. has experienced an increase in its industrial power which has meant a noticeable change in the industrial structure has occurred, initiated by a movement of resources into the E.I., often at the expense of other industries.

3.2.2. The Distribution of Market Power.

The three variables used in this section are an attempt to monitor any change in the concentration of market power, not only in the hands of the largest companies, but within the compass of all firms in the E.I.; and to examine any noted changes which may have occurred during the last two decades.

Tables 3.3 and 3.4. should be used in conjunction. The first shows the sub-headings of the E.I. divided by the size of companies (based on employment), and the percentage of establishments and employment accounted for by each of the size groups. The second table shows the result of using these percentages to construct a ratio of size distribution, and the figures presented represent the percentage of employment attached to each one percent of establishment figure within each group.*

In Table 3.3. the results demonstrate that whereas the smaller size companies account for by far the largest proportion of the total number of establishments in each sub-heading, the fewer, larger companies, supply the overwhelming majority of the employment. Both of these are continuing trends, which would lead us to believe that whilst the overall number of companies in the E.I. is contracting, as with

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* Some years occasionally present slightly different size group division, but these tend to lessen the observed trends rather than exaggerate them, so they are not likely to lead to an overstatement of the conclusions drawn.

TABLE 3.3.

The Distribution of Market Size within the E.I. : by Minimum List Heading 1958 - 1972. Measured by size of Employment.

Size by Number of Employees.

Photographic & Document Copying Equipment.	1958 Est.[a]	1958 Emp.[b]	1963 Est.	1963 Emp.	1968 Est.	1968 Emp.	1972 Est.	1972 Emp.
1 - 24			68.2	11.9	35.8	4.2	84.3	12.0
25 - 49			6.8	4.8	3.7	2.1	3.6	2.2
50 - 99		N/A	11.4	14.3	3.0	3.1	5.4	7.1
More than 100			10.2	66.7	12.7	85.4	6.6	78.5
Watches & Clocks.								
1 - 24	60.4	6.0	52.6	4.0	45.1	3.4	69.8	4.4
25 - 49 (1958 only 25 - 199)	28.7	20.0	6.4	2.0	8.5	1.7	4.1	0.8
50 - 99	-	-	10.3	5.0	8.5	3.4	9.6	4.4
100 - 749 (1958 only more than 200)	10.8	74.2	20.5	86.9	24.4	90.6	11.0	21.3
More than 750	-	-	-	-	-	-	5.5	69.1
Surgical Instruments.								
1 - 24			71.7	21.1	70.8	17.4	80.4	15.2
25 - 49			8.6	9.0	7.0	6.6	7.0	6.6
50 - 99			6.4	12.5	5.9	11.1	5.5	10.7
100 - 199		N/A	3.9	12.5	6.9	16.0	3.6	14.1
200 - 399 (1963 only 200 - 499)			2.9	11.3	3.0	14.2	1.9	16.0
400 - 749 (1963 only 500 - 749)			0.9	6.4	0.7	6.2	0.8	11.9
More than 750			4.1	26.0	4.7	25.7	0.9	25.5
Scientific & Industrial Instruments & Systems.								
1 - 24			48.7	3.5	52.3	4.4	66.2	6.0
25 - 49		N/A	6.2	1.8	6.9	2.1	7.0	2.6

Table 3.3. cont...	1958		1963		1968		1972	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.
50 - 99			7.9	4.0	8.1	4.9	9.8	7.0
100 - 199	N/A		6.7	6.2	5.1	5.4	6.2	9.5
200 - 499			8.3	14.8	7.9	13.5	6.1	18.6
500 - 999			4.7	10.6	3.6	10.8	2.5	17.4
More than 1000			12.0	57.8	10.5	58.6	2.0	39.0
Electrical Machinery.								
1 - 24	55.6	2.3	46.1	1.6	39.8	1.9	58.7	4.0
25 - 49	7.7	1.1	7.9	0.9	8.4	1.1	9.0	1.9
50 - 99	10.8	2.9	8.3	1.9	8.6	2.3	10.2	4.1
100 - 199	7.4	4.1	5.4	2.2	5.8	3.1	6.8	5.8
200 - 399 *	7.4	8.2	9.3	6.9	8.6	7.2	5.4	8.6
400 - 999 *	6.0	14.6	7.9	7.7	10.3	12.1	6.0	23.6
1000- 1999	2.9	15.9	2.2	4.3	3.8	5.1	2.1	16.0
More than 2000	2.2	51.1	12.8	74.5	14.7	67.1	1.7	35.9
Wires and Cables.								
1 - 24	27.2	0.9	14.7	0.4	18.8	0.4	36.5	1.0
25 - 99	28.8	2.4	16.5	1.5	9.9	1.3	14.1	1.9
100 - 199	8.1	1.7	11.9	3.0	5.9	1.3	15.3	4.2
200 - 499	19.6	12.2	13.7	5.1	10.9	3.5	10.6	6.5
More than 500	27.2	82.1	43.1	90.0	54.5	93.3	23.5	86.5
Telephonic & Telegraphic Apparatus.								
1 - 24	20.4	0.39	14.0	0.1	30.1	0.7	56.2	0.8
25 - 99	24.3	2.0	8.6	0.5	14.7	1.2	9.2	0.7
100 - 499	32.0	10.6	21.5	2.9	7.4	3.0	18.5	5.5
More than 500	25.0	87.2	55.9	96.5	47.8	96.0	16.1	93.1

* 1963 & 1968; 200 - 499 and 500 - 999

Table 3.3. cont...	1958		1963		1968		1972	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.
Radio & Electronic Components.								
1 - 24			45.1	2.0	51.8	3.1	69.5	3.9
25 - 49			5.7	0.9	5.0	1.2	5.2	1.3
50 - 99			8.1	2.6	5.4	2.2	6.7	3.4
100 - 199			9.5	4.9	7.7	5.0	5.1	5.3
200 - 499	N/A		5.9	7.3	10.9	13.3	8.7	19.7
500 - 999			5.9	10.5	2.6	8.0	2.3	11.4
1000 - 1499			1.4	5.2	1.5	3.9	0.9	7.4
1500 - 3999			5.2	16.3	2.7	11.6	1.0	16.7
More than 4000			13.1	50.1	12.5	51.8	0.6	30.0
Broadcast Receiving & Sound Reproducing Equipment.								
1 - 24			31.5	0.7	55.2	1.9	67.3	2.3
25 - 49			9.1	0.7	4.4	0.7	5.9	0.8
50 - 99			10.5	1.9	5.5	1.2	5.9	1.5
100 - 199	N/A		7.7	2.3	4.9	2.2	5.3	3.6
200 - 1999			16.8	19.0	9.8	14.7	13.1	32.9
More than 2000			24.5	75.2	20.2	79.2	2.4	58.9
Electronic Computers.								
1 - 24			40.0	1.9	46.3	2.1	59.5	2.1
25 - 99			6.7	1.0	9.0	2.1	15.2	2.6
100 - 199	N/A		4.4	1.9	10.4	4.2	7.6	3.4
200 - 399			2.2	1.0	3.7	7.5	6.3	6.0
More than 400			42.2	94.2	30.6	88.7	11.4	85.9
Radio, Radar & Electronic Capital Goods.								
1 - 24			42.9	1.7	44.2	2.2	43.4	3.7
25 - 49			6.8	0.9	7.1	1.2	5.8	1.1

Table 3,3. cont...	1958		1963		1968		1972	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	ESt.	Emp.
5o - 99			8.5	2.0	6.3	1.9	7.5	2.9
100 - 199			3.1	1.6	3.9	2.8	5.5	3.7
200 - 499	N/A		5.8	3.6	5.8	5.9	5.8	10.2
500 - 999			2.4	3.6	5.2	6.4	3.5	16.2
1000 - 2999			9.5	16.1	6.8	12.6	3.5	30.8
More than 3000			21.1	70.4	20.7	67.0	1.0	31.3
Domestic Electrical Goods.								
1 - 24	38.2	1.5	42.7	1.4	44.5	1.5	60.8	2.7
25 - 49	8.5	1.1	8.9	1.1	9.2	1.2	3.9	0.6
50 - 99	17.6	4.3	6.0	1.5	8.1	2.3	9.3	2.7
100 - 499	23.0	19.0	18.1	9.9	13.8	10.3	13.2	12.0
500 - 999	3.6	9.1	10.9	15.9	7.8	9.9	6.6	21.0
1000 - 1999	6.7	32.0	3.2	9.3	5.3	11.9	3.1	19.8
More than 2000	2.4	32.7	10.1	60.8	11.3	62.8	3.1	41.7
Miscellaneous.								
1 - 24	58.9	5.1	60.9	5.5	63.8	4.7	81.1	11.1
25 - 49	10.5	3.1	7.8	2.6	6.1	1.7	4.9	2.7
50 - 99	9.8	5.6	8.3	4.4	5.8	2.9	5.4	5.8
100 - 199	8.0	9.3	5.5	6.0	5.1	4.8	3.4	6.9
200 - 499	7.0	18.1	7.4	13.5	7.1	8.5	2.8	14.6
500 - 1499	4.9	31.8	3.1	9.0	2.6	9.3	1.5	17.4
More than 1500	1.3	27.2	6.9	58.9	9.4	68.1	0.9	41.5

Source : Calculated from Report on the Census of Production (various issues) H.M.S.O.

[a] % establishments in each size group.

[b] % employment in each size group.

The percentages will not always total 100% because of limitations in the census data from which the calculations were made.

most industries, the specialised nature of the industry's production means that there is still room for the small firm. At the other end of the scale, rationalisation has led to fewer numbers but much larger individual companies.

Combining these results with the ratios presented in Table 3.4., several interesting observations can be made. This table can be examined in two ways, vertically and horizontally. The former shows the relative size of companies in the various size groups. It is obvious that the largest of these are significantly bigger than the average firm of the smaller groups, and that the larger companies account for a disproportionately high share of labour supply. If the results are compared over the years it can also be seen that the gap is widening. Also, apart from a few exceptions between 1958 and 1963, the trend is toward an acceleration of the speed with which the larger firms are becoming dominant in most sectors of the industry.

Looking at the figures horizontally the growth of the individual size groupings can be compared over time. This reveals two facts. Firstly, the overall size of companies tends to be increasing at the upper end of the scale, and remaining fairly stable (or even declining) at the lower end. i.e.larger companies are getting larger, and the decline of some smaller companies is only just being offset by either low levels of growth amongst the others, or the arrival of new firms.

Amalgamation has already been seen to be the most popular vehicle of growth amongst the larger companies, and this means that fewer, larger firms, control ever greater proportions of the factors of production. This is supported by the greater changes being recorded in the results for the firms at the

TABLE 3.4.

Size Ratios* for Market Distribution in the E.I.; by Minimum-List-Heading, 1958-72.

Classification by Employee Numbers.	1958	1963	1968	1972
Photographic & Document Copying Equipment.				
1 - 24	N/A	0.17	0.12	1.14
25 - 49	N/A	0.71	0.57	0.61
50 - 99	N/A	1.25	1.03	1.31
More than 100	N/A	6.53	6.72	11.89
Watches & Clocks.				
1 - 24	0.10	0.08	0.07	0.06
25 - 49	0.70	0.31	0.20	0.19
50 - 99	-	0.49	0.40	0.46
100 - 749	6.90	4.24	3.71	1.94
More than 750	-	-	-	12.56
Surgical Instruments & Appliances.				
1 - 24	N/A	0.29	0.25	0.19
25 - 49	N/A	1.05	0.94	0.94
50 - 99	N/A	1.95	1.88	1.95
100 - 199	N/A	3.20	2.32	3.92
200 - 399	N/A	3.90	4.70	8.42
400 - 749	N/A	7.11	8.93	14.88
More than 750	N/A	6.34	5.47	28.33
Scientific & Industrial Instruments & Systems.				
1 - 24	N/A	0.07	0.08	0.09
25 - 49	N/A	0.29	0.30	0.37
50 - 99	N/A	0.51	0.60	0.71
100 - 199	N/A	0.93	1.06	1.53
200 - 499	N/A	1.78	1.71	3.05

Table 3.4. cont...

	1958	1963	1968	1972
500 - 999	N/A	2.26	3.00	6.96
More than 1000	N/A	4.82	5.58	19.50
Electrical Machinery.				
1 - 24	0.04	0.03	0.05	0.07
25 - 49	0.14	0.11	0.13	0.21
50 - 99	0.27	0.23	0.27	0.40
100 - 199	0.55	0.41	0.53	0.85
200 - 399	1.11	0.74	0.85	1.60
400 - 999	2.43	0.97	1.17	3.93
1000 - 1999	5.48	1.95	1.34	7.62
More than 2000	23.23	5.82	4.56	21.12
Wires and Cables.				
1 - 24	0.03	0.03	0.02	0.03
25 - 99	0.08	0.09	0.13	0.13
100 - 199	0.21	0.25	0.22	0.27
200 - 499	0.62	0.37	0.32	0.61
More than 500	3.02	2.09	1.71	3.68
Telephonic and Telegraphic Equipment.				
1 - 24	0.01	0.01	0.02	0.14
25 - 99	0.08	0.05	0.08	0.07
100 - 499	0.33	0.13	0.29	0.29
More than 500	3.49	1.73	2.01	5.78
Radio & Electronic Components.				
1 - 24	N/A	0.04	0.06	0.05
25 - 49	N/A	0.16	0.24	0.25
50 - 99	N/A	0.32	0.41	0.51
100 - 199	N/A	0.52	0.65	1.04

Table 3.4. cont...	1958	1963	1968	1972
200 - 499	N/A	1.24	1.22	2.26
500 - 999	N/A	1.78	3.08	4.96
1000 - 1499	N/A	3.71	2.60	8.22
1500 - 3999	N/A	3.13	4.30	16.70
More than 4000	N/A	3.82	4.14	50.00
Broadcast Receiving & Sound Reproducing Equipment.				
1 - 24	N/A	0.02	0.03	0.03
25 - 49	N/A	0.08	0.16	0.13
50 - 99	N/A	0.18	0.22	0.25
100 - 199	N/A	0.30	0.45	0.68
200 - 1999	N/A	1.13	1.50	2.51
More than 2000	N/A	3.07	3.92	24.54
Electronic Computers.				
1 - 24	N/A	0.47	0.04	0.03
25 - 99	N/A	0.15	0.23	0.17
100 - 199	N/A	0.43	0.40	0.45
200 - 399	N/A	0.45	2.00	0.95
More than 400	N/A	2.23	2.90	7.53
Radio,Radar & Electronic Capital Goods.				
1 - 24	N/A	0.04	0.05	0.08
25 - 49	N/A	0.13	0.17	0.19
50 - 99	N/A	0.23	0.30	0.39
100 - 199	N/A	0.52	0.78	0.67
200 - 499	N/A	0.62	1.01	1.76
500 - 999	N/A	1.50	1.23	4.63
1000 - 2999	N/A	1.69	1.85	8.80
More than 3000	N/A	3.34	3.24	31.30

Table 3.4. cont...	1958	1963	1968	1972
Domestic Electrical Goods.				
1 - 24	0.04	0.03	0.34	0.04
25 - 49	0.13	0.12	0.13	0.15
50 - 99	0.24	0.25	0.28	0.29
100 - 499	0.83	0.55	0.75	0.91
500 - 999	2.53	1.46	1.27	3.18
1000 - 1999	4.78	2.91	2.24	6.39
More than 2000	13.62	6.02	5.56	13.45
Miscellaneous.				
1 - 24	0.09	0.09	0.07	0.14
25 - 49	0.29	0.33	0.28	0.55
50 - 99	0.57	0.53	0.50	1.07
100 - 199	1.16	1.09	0.94	2.03
200 - 499	2.59	1.82	1.20	5.21
500 - 1499	6.49	2.90	3.58	11.60
More than 1500	20.92	8.54	7.25	46.11

* From Table 3.3. - $\frac{\%\ \text{Employment in Size Groups}}{\%\ \text{Establishments in Size Groups.}}$

Source; Author's own Calculations.

larger end of the spectrum.

These results are not universally true of all the individual sectors of the industry, nor exist in equal strength throughout the E.I.. The largest companies, on average, were found in the Miscellaneous; Photographic and Document Copying Equipment; Domestic Electrical Goods; and Electrical Machinery headings in 1963. By 1972, the picture has changed rapidly. Although Miscellaneous Electrical Goods still appears, the other sectors displaying the largest companies were Radio and Electronic Components; Radio, Radar and Electronic Capital Goods; and Broadcast Receiving and Sound Reproducing Equipment, all firmly anchored in the electronics side of the E.I..

These same four sectors also show the greatest growth in company size. This would imply that the rapid growth of these headings is due more to the efforts of the larger companies than those of the smaller firms.

The headings with the smallest average firm size in 1963 were Telegraphic and Telephonic Equipment; and Wires and Cables. These were still the smallest in 1972, and exhibited the smallest range in company size and growth of range. This implies that in these headings the large company is by no means increasing its dominance as the above areas. However, looking closely at these two headings it is noticeable that in each case the largest group of companies completely dwarfs all others, even the next class down. This is not generally true of the earlier headings, and therefore it could be said that the lack of growth in the range of company size is because of the excessive concentration of power already existing at the beginning of the period.

This is bourne out by the fact that the results of a 5-firm concentration ratio as presented in Chapter 2, shows that these two sectors display the highest ratios. The overall figures are probably low in this example because the upper size group in published statistics is 500 employees and above, whilst in these sectors the larger scale of production unit means that a relatively high number of companies are caught in the upper group (see Table 3.4.) which reduces the ratio accordingly.

The results suggest two further hypotheses. Firstly, that these larger companies are more greatly involved in the rationalisation of the E.I. thus initiating structural change, and secondly, that this should be witnessed by possible changes in the level of concentration in the industry.

These two contentions can be evaluated by two further methods. If these hypotheses were to be proved correct, some change in the concentration of net asset worth should be in evidence, and also variations in the level of merger activity should be present, enabling industrial rationalisation to take place via the medium of the takeover bid.

Computing a 10-firm concentration ratio of net asset worth for the E.I. shows that in 1954, 61.4% of the net asset value of all companies operating within the E.I. was held by the ten largest firms and their subsidiaries. By 1965 this figure had risen marginally to 64.6% and finally accelerated to 75.3% in 1973. This supports the original contention that the emphasis of industrial dominance in the industry was shifting more and more towards the larger firms.

Combining this with evidence upon the level of merger act-

ivity in the industry during the period, it becomes immediately obvious that by far the greatest number of mergers, both in numbers and the value of equity changing hands, has occurred in the late 1950's and early 1970's. The industry has experienced the greatest numbers of mergers and value of assets acquired, of all the manufacturing sectors of the U.K., and also has the highest percentage of such mergers taking place between companies already within the E.I.. (Board of Trade 1969).

Chapter 2 presented discussion on recent mergers within the E.I. and it was evident that these combinations were ones of expansion, aimed at market dominance or a strengthening of market position, and not generally moves by the E.I.'s firms into other industries. Broadly speaking this high mobility indicates a more fluid and dynamic industrial structure than appears to be evident from changes in the level of concentration alone, but in some ways this reflects the considerably high mobility of firms in the U.K. with regards other countries of the developed world. (Utton 1971-2).

In conclusion, therefore, the E.I. exhibits a tendency towards the exaggeration of the market dominance of the large company. The industry has a very few large companies controlling disproportionate shares of labour input and the ten biggest companies controlled an ever increasing amount of the net asset worth, rationalising and changing the industrial structure through changes in the distribution of market power, largely via the vehicle of the company merger. Combining this with the previous section of the study, clearly this increased share of the larger firms is a growing proportion of an all-round larger market, and the expansion of the E.I. in recent years

would appear to have been enhanced by the vigorous role of such firms. (An eight firm sales concentration ratio in 1965 gave a result of 67%, whereas the figure had risen to 72% by 1976).

3.2.3. Product and Process Structure.

One of the criteria for any discussion of industrial structure must be related to the diversity of product mix and the relationship between the input and output of companies within the industry. Namely, horizontal and vertical integration.

The presence of multinational corporations and their affiliates in U.K. industry means that any discussion of product range is difficult because of the problems of scale, and therefore the concept of a product base is used, i.e. that any companies which are related in such a way as to be called "an industry" must in some way display the idea of a related product base which allows classification as a homogeneous group.

Having established that these companies must be product related, a useful concept is one of the nearness to the product base definition. The level of diversification and vertical integration are measures of the interrelationship existing between the companies of the E.I. in terms of this product and process structure. If either (or both) of these measures show a significant change it can be asserted that either the product mix or the nature of their face to face competition within the product chain has altered sufficiently to justify the hypothesis that industry structure has indeed altered.

The results show that this is exactly the case. Table 3.5. presents the findings of the calculations using the index

TABLE 3.5.

The Level of Diversification* within the E.I. : 1954-74.

Date.	Index of Diversification.
1954	0.79
1958	0.43
1963	0.25
1968	0.25
1971	0.24
1972	0.10
1974	0.09

* $D = 1 - \sum_{i=1}^{n} pi^2$ where D (0<D<1) is the proportion of firms sales in the industry, devoted to the major products of the S.I.C. classification for that sector, and

'0' represents zero diversification,

+1 infinite diversification.

pi = Industry output in the ith Industry / Industry output in n industries.

(see chapter 2 for further definition)

Source: Report on the Census of Production, (Various Issues)H.M.S.O.
U.K. Input-Output Statistics (Various Issues)H.M.S.O.

of diversification previously defined. Here the figures refer to production by companies of the E.I. within their major product lines as a proportion of total sales, whether attributable to the industry or not.

The data show that the industry has slowly become less diversified and more specialised. This could be exaggerated, however, by the movement of large scale companies into less easily definable product areas. For example, electrical domestic appliances, where the definitive product area is in itself highly diverse. The movement is large enough to suggest that not all of the noted alteration in the level of diversification could have been initiated in such a way.

The expansion of the E.I. and the rapid advancement of technological expertise and large scale capital expenditure necessary to compete in such fields would probably account for a move towards the streamlining of company activity.

It is not being suggested here that the range of products available, as produced by firms in the E.I., is contracting, or that the larger corporations are not consistently expanding their product base, but that a widening of the product range in the E.I. has led to a need for specialisation by the individual affiliates. This is true of even affiliates of the largest multi-national corporations, to maintain their competitive edge.

The period 1968-74 exhibits a sudden increase in the level of specialisation in the E.I.. One hypothesis, to be examined later, is that these figures can be partially explained by the high level of D.F.I. in the industry during the early and middle 1960's, followed by heavy rationalisation as demonstrated by the high level of merger activity immediately prior to the beginning

TABLE 3.6.

The Level of Vertical Integration* within the E.I.; 1954-76.

Date.	V.I. (%).
1954	6.36
1963	9.17
1968	14.65
1971	15.90
1976	17.95

*Represents the percentage of purchases by major companies in the E.I. from companies under the same ownership.

Sources; Calculated from:-

Report on the Census of Production (various issues)

U.K. Input-Output Statistics 1971.

The Extel Service.

Company Accounts.

of the 1970's.

Secondly, the level of vertical integration is examined. Here the level of sales by major companies in the E.I. from other companies within the same ownership structure provide the data. Table 3.6. shows the results of this study and demonstrates the increasing level of vertical integration existing in the E.I.. There is a noticeable increase in this degree of integration from the mid-1960's onwards, possibly accelerated by the growing presence of foreign and U.K. owned affiliates of multinational companies, servicing their parents, internalising markets, and making use of the merger/takeover as a vehicle for upward and downward integration.

Thus finally, in terms of diversification and vertical integration, the structure of the E.I. has again been seen to change during the last two decades, and more noticeably since the middle 1960's. The industry has become more specialised and has experienced higher levels of vertical integration, which supports the earlier contention that the larger companies are becoming more dominant, and that specialisation is the premier method of survival for smaller and medium sized companies, as well as for the individual affiliate of larger corporations.

3.2.4. The Ability to Protect the Market from New Entrants.

Three measures of the market's ability to defend its autonomy against potential entrants are utilised. These consist to two types of entry barrier, and one of the power to

TABLE 3.7.

Research and Development* costs as a percentage of Output :1962-75:

Date.	E.I. (%).	All U.K. Industry (%).
1962	3.39	0.60
1964	3.67	0.72
1966	4.77	0.86
1968	4.86	0.87
1970	5.53	0.90
1975	5.88	1.44

*(Current and Capital - Depreciation).

Source: Calculated from Abstract of Statistics (various issues) H.M.S.O.

keep market rationalisation and expansion confined to companies already present.

The overhead unit cost of production, where R&D costs as a percentage of sales revenue is used as a proxy; and economies of scale, where the labour productivity of larger and smaller firms are compared, are the two entry barriers concerned. The percentage of merger activity kept within the E.I., and the expansion of average firm size are taken as indicators of the ability of the industry to keep expansion within the boundaries of the companies already present.

Taking R&D costs as symptomatic of the level of unit overhead costs of production faced by the potential entrant, (see section 3.1.1. part (iv)), Table 3.7. shows that R&D costs as a percentage of sales revenue in the E.I. are far greater than for other sectors of U.K. industry, and that these costs are growing rapidly. The average newcomer must be prepared to apportion large amounts of capital to research and development. This often necessitates either a very high degree of specialisation or large scale production techniques which enable the new entrant to spread the total R&D commitment over a greater return from turnover. Therefore one cause of the high level of merger activity could possibly be the need for expert know-how and an immediate availability of larger scale production.

The conclusions are also supported by the second set of entry barriers, namely the increased labour productivity of the larger companies as a measure of economies of scale within the E.I.. Table 3.8. calculates the cost of production in terms of wage bill, to the total return on sales gained from its employment.

TABLE 3.8.

Total Labour Productivity* : 1948-76.

Date.	E.I.	All U.K. Industry.
1948	.66	.83
1951	.68	.85
1954	.62	.84
1958	.69	.83
1963	.71	.83
1968	.72	.83
1971	.73	.80
1972	.73	.77
1976	.74	.77

*(1-Wage Bill/Total Sales).

Source : Calculated from Report on the Census of Production, (various issues). H.M.S.O.

Although in general the labour productivity of the E.I. is lower than the average for all U.K. manufacturing, the former is rising whilst the latter is falling. Also the more efficient users of labour, such as the mass production industries, will exaggerate the overall figure.

To establish if size is necessary for the new entrant to be a viable threat to the market power structure, the economies of scale present in the industry which might deter all but the larger scale subsidiary are measured.

In order to do this the top 10% of the industry by size are compared to the bottom 10%, and reduced to an index.

$$\text{i.e. } \frac{1 - \text{Wage Bill/Total Sales of Top 10\%.}}{1 - \text{Wage Bill/Total Sales of Bottom 10\%.}}$$

The results of this analysis are presented in Table 3.9.. These demonstrate that the labour productivity of the largest firms is obviously higher than that of the smaller group, suggesting evidence of economies of scale, and that the figures are, in general, rising. (A result of higher than 1 represents the presence of economies of scale).

So there is a size barrier present, facing the potential entrant, as well as one of the increasing efficiency of most firms in the industry. However, development of the large scale firm is not necessarily leading to greater efficiency over all smaller firms, although economies of scale are indeed present in the minimum-list-headings of the E.I.. This is supported by evidence that in most sectors the largest firms are not necessarily the most efficient users of labour.

TABLE 3.9.

Economies of Scale* (Labour Productivity) in the E.I. :

by Sector, 1958-72.

Sector.	1958	1963	1968	1972
Photographic	1.36	1.32	1.74	1.11
Surgical Instruments			0.83	0.96
Scientific Instruments			0.97	0.97
Watches and Clocks	1.02	0.88	0.77	0.78
Electrical Machinery	1.03	0.87	1.39	1.40
Wires and Cables	0.99	0.94	1.20	1.30
Telephone and Telegraph	1.00	1.15	1.03	1.05
Radio and Electronic Components			1.67	1.72
Broadcast receiving and generating equipment	0.97	1.09	1.07	1.13
Computers			0.88	1.02
Radio,Radar and Electrical Capital Goods			1.05	1.10
Domestic Appliances	1.23	1.36	1.23	1.23
Miscellaneous	1.25	0.99	1.12	1.20

*(Labour Productivity of Largest 10% / Labour Productivity of smallest 10%)

Source : Calculated from Report on the Census of Production (various issues). H.M.S.O.

Examining each of the major size groups individually in the various sectors, it was found that the most efficient are often the medium sized companies. These being the ones usually just below the largest sized group, and suggests that increased size does increase labour productivity until an optimum size is reached, and that most large firms in the E.I. are experiencing the dis-economies of too great a size.

This will also be exaggerated by the labour intensiveness of the assembly orientated sectors of the E.I., and therefore the unfavourable impression created by the E.I. is not necessarily reflected in other measures of efficiency. The necessity to employ large numbers of employees as well as use them efficiently are of joint importance to the would be entrant, as both will necessitate decisions as to operating size.

To eliminate any suggestion of bias, the same larger 10% of the population were compared with all the remaining 90% of the E.I.'s firms, and the same results appeared, but naturally the former outperformed the latter to a much smaller degree. The conclusion, therefore, being drawn from two sets of calculations, would appear to be reflective of the actual situation, and would suggest that barriers to entry are reasonably high in the E.I., and that this is in keeping with the fact that the level of merger activity involving companies which are both involved in the industry is extremely high.

Weight is also added to the argument by the large proportion of foreign entrants which are themselves already classified within their own country's E.I., and therefore possess much of the expertise necessary for successful participation within the host country's E.I.. Also most of the annual inflow

of D.F.I. is directed to expansion in the industry by affiliates already present, whether it be either in their size or number. This constant rationalisation from within is witnessed by the constantly increasing average firm size in the E.I. and the development of the super-giant company such as G.E.C., Philips, B.I.C.C., Thorn, Hawker Siddeley and others.

Several conclusions can now be drawn about the nature of the overall structure of the E.I. and its noted changes.

3.2.5. Conclusions.

The industry has experienced an above average growth in productive capacity, and an increasing level of importance within the U.K. economy. This is particularly true of the last fifteen years, when the E.I. has enjoyed a faster level of growth of value added than any other industrial sector.

During this period there has also been a tendency for a disproportionate expansion of the larger companies of the E.I. with a resulting increase in the concentration of net asset worth. The trend is for an acceleration of the speed with which the large firms are dominating both the purchasing of inputs, and the sale of output of the E.I..

Company merger/takeover is the most popular vehicle for industry rationalisation, and the increased level of such activity has added a dynamic quality to the mobility of firms within the industry. The highest percentage of such mergers have taken place between firms who were both in the E.I., and this facilitates the increased concentration of market power in recent years.

Moreover, these firms have become more specialised over the years and have taken the opportunity, whenever possible, to

increase their span of control over the supply of their factors of production and sales of finished products with a much greater degree of vertical integration of an up- and down- stream nature.

This higher level of industrial specialisation and rapidly growing size is reflected in the increased level of entry barriers, with high costs of production, especially those specifically associated with the production of technology goods largely of an intermediary nature such as R&D expenditures. Also the increasing efficiency of firms in the E.I. and the need for large scale production techniques, discourages potential entrants other than those with the necessary expertise or large scale capital available. This would help account for the lack of diversification in the E.I.'s companies as it becomes more difficult for non-electrical engineers to diversify into the E.I. from their own industry, and curtails the ability of firms to engage in cross-sector mergers between the various, more specialised, sectors of the E.I. itself, except for the largest companies.

The E.I. is, therefore, becoming a much tighter, cohesive unit, as it develops at a faster rate than other sectors of the economy. Larger companies are dominating most of the sub-headings of the industry, and expanding both upstream and downstream into all levels of the production chain. There is still a place for the small company, but these are usually either involved in highly specialised areas of production, or provide technical services for their larger counterparts. The tendency is not, therefore, for firms to expand organically into diverse activities but for the larger parents to tie to-

gether chains of smaller, more specialised companies, obtaining the benefits of diversification of production through the varying specialisms involved.

Finally it can be said that, using the four fold definition as laid down above, industrial structure has changed significantly on all fronts. Its size has increased remarkably using any yardstick of activity as a contribution to the U.K. economy. Meanwhile the numbers of firms within the industry has begun to fall (as in most other industries) whilst average firm size has increased. The distribution of market power has altered, with the larger companies expanding more than proportionately. The industry has moved closer to its definitive product base, whilst firms attempt to place as many of the stages in the process structure as possible under the same ownership. Finally, the ability to protect the market from would-be entrants has increased markedly, both in terms of economies of scale and the costs of production. The level of merger activity has increased over the last decade or so, and this has contributed greatly to the changing structure of the E.I..

3.3. Summary.

3.3.1. The term 'industrial structure' is here defined as consisting of four elements; namely, productive capacity, the distribution of market power, the product and process structure, and the level of entry barriers.

3.3.2. These may be modified by a series of secondary variables including company performance, location, and the domestic reaction of domestic firms and governments. (see Chapter 6 for analysis)

3.3.3. Changes in any one (or more) of the primary variables can be construed as a modification of industrial structure.

3.3.4. The industrial structure of the E.I. has changed considerably since the second world war, and more specifically during the last two decades.

3.3.5. The industry has experienced a significant growth in the size of productive capacity during this period.

3.3.6. The E.I. has become increasingly specialised as many of the older sectors have decreased in importance and electronics has come to the fore.

3.3.7. Increasing vertical integration has taken place as companies have expanded up- and down-stream to control more elements of the process chain.

3.3.8. Entry Barriers have grown more formidable to potential entrants to the E.I..

3.3.9. Most of the aforementioned changes stem from the growing importance and dominance of the industry's larger companies.

3.3.10. Firm size has increased, whilst total numbers of establishments have begun to fall. Meanwhile merger activity is the highest of any industrial sector.

3.3.11. This pressure for change stems from three sources, at an Economy, Industry and Firm level.

3.3.12. The first two of these can be designated a 'Destination' effect and the third a 'Behavioural' effect.

3.3.13. The 'Behavioural' effect consists of two points of measurement; namely; the primary and secondary variables mentioned above.

CHAPTER 4.

DIRECT FOREIGN INVESTMENT IN THE ELECTRICAL AND INSTRUMENT ENGINEERING INDUSTRY.

The U.K. economy has seen four distinct periods of direct foreign investment. The first consists of the gradual infiltration of foreign affiliates beginning with J.Ford & Co. in 1856, and ending in 1914. The development of foreign countries, particularly the U.S. as industrialised exporters of goods and capital, coupled with a restrictive British protectionist policy towards imported manufactured goods, encouraged even higher levels of direct investment in the inter-war period. The pace of this involvement has increased dramatically since the second world war. This is mainly because the greatest foreign penetration has been concentrated in those science-based, service and consumer industries which were experiencing the fastest growth rates. The final period covers the years from 1960 to the present day, when the level of investment, and the popularity of the takeover method of entry and expansion, have increased enormously. This stems from the basic belief by foreign parents that they can earn higher long-term profits from investing money in the U.K. than from expansion of their domestic markets.

The E.I. has also witnessed this process of foreign infiltration, but whereas the majority of the largest multinationals have owned operating affiliates in the U.K. since before the second world war, the expansion of foreign affiliates

of all sizes into the U.K. Electrical and Instrument Engineering Industry has been largely of comparatively recent origin.

The rapid development of the E.I., and its changing industrial structure have already been demonstrated. It was hypothesised that the presence of D.F.I. can exert an influence at three stages. Attention is now focused upon the first two stages of pressure, namely the Economy and Industry level, which together comprise the Destination effect of D.F.I.. Thus the role of this chapter is to examine the influence upon the structure of the E.I. of the overall distribution of D.F.I. firstly throughout the industries of the economy, and secondly within the minimum-list-headings of the industry.

The size and industrial origin of the parent companies are studied, along with the varying methods of entry into the U.K. industry. The chapter examines the type of ownership structures established by foreign parents in comparison to other indigenous companies; the levels of committed capital directed to the E.I. from abroad in relation to investment in other U.K. industries; and finally the characteristics of differing geographical sources of investment are noted.

Such factors affect the behavioural decision making process of both established foreign and indigenous industry as the structural environment within which they operate adapts to the entry and operation of the foreign participants. This in turn must affect the performance of the industry and thus its contribution to the U.K. economy.

4.1. The Characteristics of D.F.I. in the E.I..

Firstly, the characteristics of D.F.I. within the industry are examined. Data upon the size, sources, profitability, methods of entry and ownership structures of such investment in the E.I. is presented. The implications of such characteristics for the industrial structure of the E.I. at an economy-level are charted at the end of the section.

4.1.1. The Size of Investment.

Between 1965 and 1976, direct investment by foreign parents in the E.I. grew at an average annual rate of over 32%, whilst the same figure for aggregate net investment in all U.K. sectors averaged less than 21%. It would appear, therefore, that this sector has been one of the most attractive fields of direct investment by overseas multinationals in this period.

Table 4.1. shows that as well as growing in importance relatively, the absolute increase in the amount of investment finding its way into the E.I. has meant that whilst in 1965 six major industrial sectors accounted for a larger proportion of the total foreign participation, by 1968 the figure had fallen to three, and by 1976 only mechanical engineering and the miscellaneous sectors comprising 'other activities' attracted larger amounts of foreign investment. These figures, however, cover non-linear trends, and the pattern of such investment appears to fall into two particular periods, namely; the early and middle 1960's, and the late 1960's and early 1970's.

The stock of D.F.I. in the E.I. has grown from an esti-

TABLE 4.1.

Book Values of Net Assets Attributable to Overseas Investors by industry : 1965 - 76.

Industry	1965 (£m)	%	1968 (£m)	%	1971 (£m)	%	1976 (£m)	%
Food/Drink/Tobacco	187	9.4	303	11.2	392	10.3	748	11.5
Chemicals	227	11.4	330	12.1	460	12.1	710	10.9
Metal Manufacturing	154	7.7	174	6.4	259	6.8	294	4.6
E.I.	185	9.3	324	11.9	466	12.2	758	11.7
Vehicles	304	15.2	352	13.0	385	10.1	472	7.3
Other Manufacturing	249	12.5	309	11.4	533	14.0	738	11.3
Distribution	244	12.2	286	10.5	393	10.3	603	9.3
Other Activity	108	5.4	169	6.2	244	6.4	1,027	15.7
Mechanical Engineering	337	16.9	471	17.3	684	18.0	1,144	17.5
Totals*	1,995		2,718		3,816		6,494	

*Excluding Oil.

Sources: Department of Trade and Industry - Trade and Industry, Nov. 1973, H.M.S.O.

Board of Trade Journal, Jan.1970, Sept. 1968, H.M.S.O.

Business Monitor(M4), 1977.H.M.S.O.

mated £70m. in 1960, to £757.5m. in 1976, faster than any other major industrial sector.

Having steadily increased its share of the total flow of net overseas investment to the U.K. from an estimated 6.7% in 1960, to a peak of 12.4% in 1971, the E.I. experienced a reduction in the growth of foreign participation along with most other major manufacturing sectors. This was partly due to larger investments in the distributive and other miscellaneous non-manufacturing activities. Correspondingly the above figure fell to 12.1% in 1972, 11.6% in 1973, and again to 10.5% by 1974. However this figure rose again by 1976 (11.7%). (See Table 4.2.)

This has not represented a serious long term shift of interest away from the E.I. by foreign investors, but a general caution about the performance of U.K. manufacturing as a whole. The rapid growth in the share of the D.F.I. directed to the E.I. has wained somewhat since the late 1960's. The annual growth in the total stock of the D.F.I. present in the E.I. has also declined from a peak of 32% in 1967, to an annual average of around 12% for the first six years of the present decade.

Again this does not appear to stem from any loss of long term confidence in the E.I., but is more a reaction to the high levels of investment during the early and middle 1960's. The E.E.C. also has become an attractive alternative for potential investors, especially whilst the U.K. walked the uncertain tightrope of European entry in the early 1970's.

The greater introspection of the U.S. economy in the face of Japanese penetration of the home market, particularly in the

TABLE 4.2.

The Stock (book value) of Net Assets Attributable to Overseas Investors : 1960 - 76.

Date	(1) E.I. (£m)	(2) Total U.K. Industry (£m)	(1) ÷ (2)x100 (%)
1960	70.0*	1,040.0	6.7
1961	96.7*	1,290.0	7.5
1962	114.4*	1,430.0	8.0
1963	135.7*	1,610.0	8.4
1964	156.6	1,780.0	8.8
1965	185.1	1,980.0	9.3
1966	219.0	2,222.9	9.8
1967	289.0	2,436.0	11.9
1968	324.2	2,728.0	11.9
1969	353.4	2,995.8	11.8
1970	390.4	3,335.9	11.7
1971	466.4	3,817.0	12.4
1972	516.4	4,226.2	12.1
1973	568.0	4,877.0	11.6
1974	587.0	5,573.5	10.5
1975	643.1	5,834.7	11.0
1976	757.2	6,493.3	11.7

*Author's estimates, based on the extrapolation of several trends. Estimates were obtained from data upon the growth rate of D.F.I. in the E.I. in real terms; its contribution to total D.F.I. in the U.K.; and the contribution of the E.I. to the Engineering sector as a whole. Finally figures for the total contribution of D.F.I. to total profitability, employment etc. in the E.I. were calculated. All such trends were analysed to find a computer assessment of the probable levels of D.F.I. directed to the E.I. grouped into the Engineering data of these years 1960-63.

Sources: Department of Trade and Industry - Trade & Industry, Nov73. H.M.S.O.
- Business Monitor, (M4), Various Issues, H.M.S.O.

CSO - Balance of Payments Yearbooks, various issues.

fields of electronics and motor vehicles, could also have discouraged excessive capital outlay abroad by the largest contributor of D.F.I.. This has probably been exacerbated by the current problems faced by both the American and U.K. economies, within a world wide recession, which could be seen as a short term block upon large scale investment decisions. The falling value of the pound, trade union unrest and persistent domestic inflation will not encourage ent in the U.K..

Finally, the expansion o apanese into the E.I., with their preference for servicing the U.K. market by export rather than D.F.I. means that their share of U.K. sales will not be matched by corresponding inflow of such investments.

This contention can be supported by the figures presented below in Table 4.3.. Here the stock of D.F.I. within the E.I. and U.K. industry as a whole is deflated by the wholesale price index, and therefore shows the real value of the convertability of the investment flows into marketable commodities, thus demonstrating the effects of inflation. Both sets of figures show the trends for an ever increasing stock of D.F.I. in real terms coming to an end in 1973, when the E.I., along with the overall stock of D.F.I. in the U.K. economy, experienced a fall in the real value of such investment.

Examining the annual flow of D.F.I., the figures for which are also deflated in Table 4.3., the pattern shows two distinct cycles. A growth in the real value of D.F.I. flow up until the devaluation of the pound in 1967, and then a sharp reduction and slow build up to a second peak in 1971, with a further fall off into the 1970's (the beginnings of a possible third cycle).

TABLE 4.3.

Stock and Annual Flow of D.F.I. in the U.K. in real terms, 1965 - 74 (£m).

Date	Stock		Annual Flow	
	E.I.	Total U.K.	E.I.	Total U.K.
1965	249.80	2302.33	38.46	232.56
1966	270.70	2615.18	41.90	285.76
1967	370.99	2893.11	89.86	253.09
1968	375.67	2871.58	40.79	307.37
1969	376.30	3150.16	31.10	281.60
1970	390.00	3335.90	37.00	354.00
1971	464.08	3666.67	75.62	462.15
1972	493.69	3891.53	47.80	376.80
1973	448.30	3304.20	40.73	440.92
1974	463.50	3954.80	15.20	650.60

Deflated by Wholesale Price Index - 1970=100

Sources: Department of Trade and Industry - Trade and Industry, Various Issues.

- Business Monitor, M4 Overseas Transactions Various Issues.

This would suggest that the level of D.F.I. flowing into a country is particularly sensitive to the overall economic environment, and industries with records of high growth and technology can be even more susceptible to the wavering confidence of overseas investors. The trend has been for the addition to the stock of D.F.I. to surpass the inflation fed rise in the cost of purchasing fixed assets, i.e. an absolute rise in the real value of investment. The evidence suggests that in recent years this trend has been reversed.

However, one further explanation could be that sufficient income is being generated domestically to cover the operating and expansion needs of the foreign affiliates, which are also loathe to undertake any major moves, given the prevailing economic climate in the U.K..

In the above tables the difference between the trends noted in the figures for the E.I. and aggregate U.K. data, are not radically dissimilar. The important point is that the E.I. has tended to outperform the industrial average in terms of attracting overseas investors. The evidence suggests that the development of the E.I. and its growing importance within the U.K. economy has been noted by foreign investors, and attracted them in above average numbers, with the proviso that the early 1970's have witnessed some reduction in this advantage.

The importance of such movements will be discussed later, however, not all parent countries exhibit the same business ethic and therefore the origin of foreign investment can be another contributor to the differential effect of D.F.I. on the industries of the U.K..

4.1.2. The Sources of Investment.

As one would expect with an industry such as the E.I., where competition is based on highly developed management and technological expertise; production processes involve large scale capital expenditure, necessitating high R&D commitment; an above average proportion of investment originates from the developed world.

The U.S.A., E.F.T.A.*, and E.E.C. have consistently contributed over 90% of D.F.I. in the industry, and their percentage shareholding reflects the dominance of the U.S.A. in total world flows of such investment. Throughout the 1960's and 1970's, between half and two-thirds of foreign investment directed towards the E.I. has originated in the U.S.. The E.E.C. countries contribute around a third of the total figure, whilst the member countries of E.F.T.A. show a declining share, from 11.6% in 1965 to 6.0% by 1976. (Table 4.4.)

From the latter two groups the largest investors have been the Netherlands and France, within the E.E.C.; and Switzerland and Sweden, who accounted for over 90% of all such investment by E.F.T.A. members. This dominance is a reflection of their position in the U.K. economy as a whole. These same three blocks account for over 85% of all D.F.I. in the U.K., the remainder being mainly the involvement of Canada in metal manufacturing, and by overseas sterling area countries in the distributive trade and other miscellaneous activities.

The table below confirms that the U.S. supplies the major share of D.F.I. in the industry (1965-61%; 1971-62.4%; 1974-70.7%; 1976-72.1%), in roughly the same proportion as to its overall involvement in the aggregate economy (1965-66%;

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*i.e. Norway, Sweden, Finland, Austria, Portugal, Switzerland, Iceland.

TABLE 4.4.

Book Values of Net Assets Attributable to Foreign Affiliates in the U.K., by Major Country, 1965 - 76. (£m).

Year	E.I.	Value	%	Total All U.K.	Value	%
1965	TOTAL	185.1			1980.0	
	of which: U.S.	112.9	61.0	1307.0		66.0
	E.F.T.A.	21.4	11.6	208.8		10.6
	E.E.C.	50.6	27.3	178.4		9.0
1968	TOTAL	324.2			2718.1	
	of which: U.S.	176.2	54.4	1822.8		67.1
	E.F.T.A.	37.2	11.5	308.6		11.4
	E.E.C.	110.5	34.1	278.2		10.2
1971	TOTAL	466.4			3817.0	
	of which: U.S.	290.8	62.4	2448.0		64.1
	E.F.T.A.	25.5	5.5	409.3		10.7
	E.E.C.	149.2	32.0	472.9		12.4
1974	TOTAL	587.0			5573.5	
	of which: U.S.	415.3	70.7	3431.1		61.6
	E.F.T.A.	33.3	5.7	571.7		10.3
	E.E.C.	137.6	23.4	713.8		12.8
1976	TOTAL	757.2			6493.3	
	of which: U.S.	545.9	72.1	4162.1		64.1
	E.F.T.A.	45.1	6.0	675.9		10.4
	E.E.C.	157.6	20.8	974.3		15.0

Source: Department of Trade and Industry -

Board of Trade Journal - Jan. 1968 and Sept. 1970.

Trade and Industry - Nov. 1973.

Business Monitor M4 - 1972, 1973, 1974, 1977.

1971-64.1%; 1974-61.6%; 1976-64.1%). However, whereas this share of the total investment stake in the U.K. economy is relatively stable, its share of the D.F.I. finding its way into the E.I. is increasing, especially as compared with investments originating from E.F.T.A. countries. (The E.E.C. and E.F.T.A. figures will be affected by the enlargement of the Common Market, however.). This leads us to the opinion that the foreign affiliates present in the E.I. are polarising into two sources, namely U.S.- owned and E.E.C.- owned (largely Dutch),* with the former showing the main growth.

Investment in the E.I. as a proportion of all U.S. direct foreign investment in the U.K. rose from 8.5% in 1965 to 12% by 1971, and 13.1% in 1976, indicating a continued preference for this sector above other industries in the U.K. as a vehicle for investment. This attraction may well be partly explained by the steadily high share of net earnings by D.F.I. accounted for by this industry as shown in the table below. (Table 4.5.)

The E.E.C. meanwhile, has always held a disproportionate level of the industry's foreign investment. In 1965 it accounted for 27.3% of the total figure, yet only 9% of the total investment in all sectors of the U.K. economy. By 1971 these same figures were 32% and 12.4% respectively, but the gap closed to 20.8% and 15.0% in 1976. Once again whilst E.E.C. investors definitely prefer to participate in the E.I. rather than other sectors of the U.K. economy, the percentage of total E.E.C. investment destined for this industry has fallen from 39.6% in 1968 to 30.5% by 1971 and 16.2% in 1976. Once again the enthusiasm of the 1960's for the industry and the desire to

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* Mainly belonging to Philips N.V.

TABLE 4.5.

Net Earnings of Foreign Affiliates in the E.I. : 1968-76. (£m).

Date	Net Earnings	E.I. Net Earnings as a % of total U.K. Earnings.	E.I. D.F.I. as a % of Total D.F.I.
1968	40	12.16	11.9
1969	34	11.04	11.0
1970	47	13.62	11.7
1971	51	13.64	12.4
1972	N/A	N/A	12.1
1973	83	12.75	11.6
1974	49	8.70	8.4
1975	85	13.76	11.0
1976	145	14.15	11.7

Source: Department of Trade and Industry -

Trade and Industry - Nov. 1973.

Business Monitor, M4, Overseas Transactions, 1972, 1973 & 1976.

participate in its growth via the medium of overseas subsidiaries, whilst not having disappeared, has certainly not been maintained, as was the case with the U.S. investors.

Whilst the growth of such investment in the E.I. begins to slow down, its initial impetus means that between 1965 and 1976, the level of stock of investment from all sources rose 50% faster in the E.I. than that in the U.K. as a whole. However, generalisations about investment levels over a prolonged period can be misleading. The content of the D.F.I. in the E.I. is changing, and if it is proved in later chapters that differing geographical sources of parent companies do exhibit differing operating characteristics then this too will be a pressure for structural change within the E.I..

4.1.3. Profitability.

Some assessment of the overall efficiency of foreign controlled firms would seem to be the next logical step. However, efficiency is a very difficult concept, and its measurement is open to many pitfalls - for example, market imperfections may introduce bias into profits as an index of efficiency; in foreign owned affiliates inter-firm pricing may not reflect market conditions; data on capital employed depends upon book valuations which may vary with accountancy practice.

The only satisfactory method of coming to firm conclusions on the efficiency of foreign controlled firms is by in-depth study of a sample of selected foreign and domestically owned companies for comparison. This has been attempted in the Chapters 5 and 6, however, to obtain some idea of the aggregate efficiency of D.F.I. the generally available figures for rates

TABLE 4.6.

Average Rates of Return* to Foreign Investors in the U.K.**:

1960 - 76.

Date	U.S.	E.E.C.	Other.	Total.
1960	16.9	5.7	15.2	12.6
1961	12.1	5.2	10.6	9.3
1962	11.4	3.9	11.1	8.8
1963	12.8	4.4	12.8	10.0
1964	13.1	11.2	8.7	11.0
1965	12.5	9.9	9.4	10.6
1966	11.0	6.9	10.6	9.5
1967	9.2	5.6	9.5	8.1
1968	10.5	6.3	11.1	9.3
1969	11.3	4.1	15.2	10.2
1970	11.8	6.6	14.0	10.8
1971	11.7	7.5	11.4	10.2
1972	13.8	11.6	11.8	12.4
1973	15.7	11.6	12.9	13.4
1976	12.7	8.5	9.3	11.6

*After Tax

** Excluding Oil, Insurance and Banking.

Source: Department of Trade and Industry -

Board of Trade Journal - 26/1/68

Business Monitor, M4, Oversea's Transactions, Various Issues.

of return on investments which can be calculated from published statistics are used. By only using these data comparatively, some of the defects of using book values should be reduced. The table above compares the rates of return on total foreign investment from U.S.,E.E.C.,and other areas between 1960 and 1976.

The U.S. figures are appreciably greater than those for the non-E.E.C. countries. Since on a priori grounds, one would expect all foreign owned affiliates to gravitate towards the more profitable sectors of the industry because of their ability to be selective in their initial point of entry, differential rates of return between sources of investment can be taken as an indication of differing efficiency. However, the E.E.C. countries have a much higher proportion of their investments in the distributive trades, though it is doubtful whether this is sufficient in itself to account for the size of the difference between this group of affiliates and those under American ownership. The age profile of investment will also have an effect, and this is discussed later in this section.

The above table shows that the rates of return on foreign investments have fluctuated over the thirteen year period, and the figure below demonstrates visually the reducing trend between 1960 and 1967; the recovery to 1976; and the later downturn probably reflecting the recession of the U.K. economy. Comparative figures for U.K. firms are still well below these rates i.e. 8.5% for 1976.

It also shows that the E.E.C. has increased relatively to all other sectors (though distorted by the increased size of the new common market. The inclusion of three more countries

will affect the overall return on investment, as there is no reason to believe that the average rate of return of affiliates owned by parents domiciled in the new entrants is identical to that of the original six). Meanwhile, the U.S. sector consistently outperforms the average for total investment, but this has not always been reflected in all other sectors. Indeed from 1967-70 the various sources comprising the 'other' group showed higher rates of return than the U.S. affiliates. (However, this can be attributed almost solely to the operations of subsidiaries belonging to parents from Canada, Switzerland and Sweden, the first two often being holding companies for groups based in other countries).

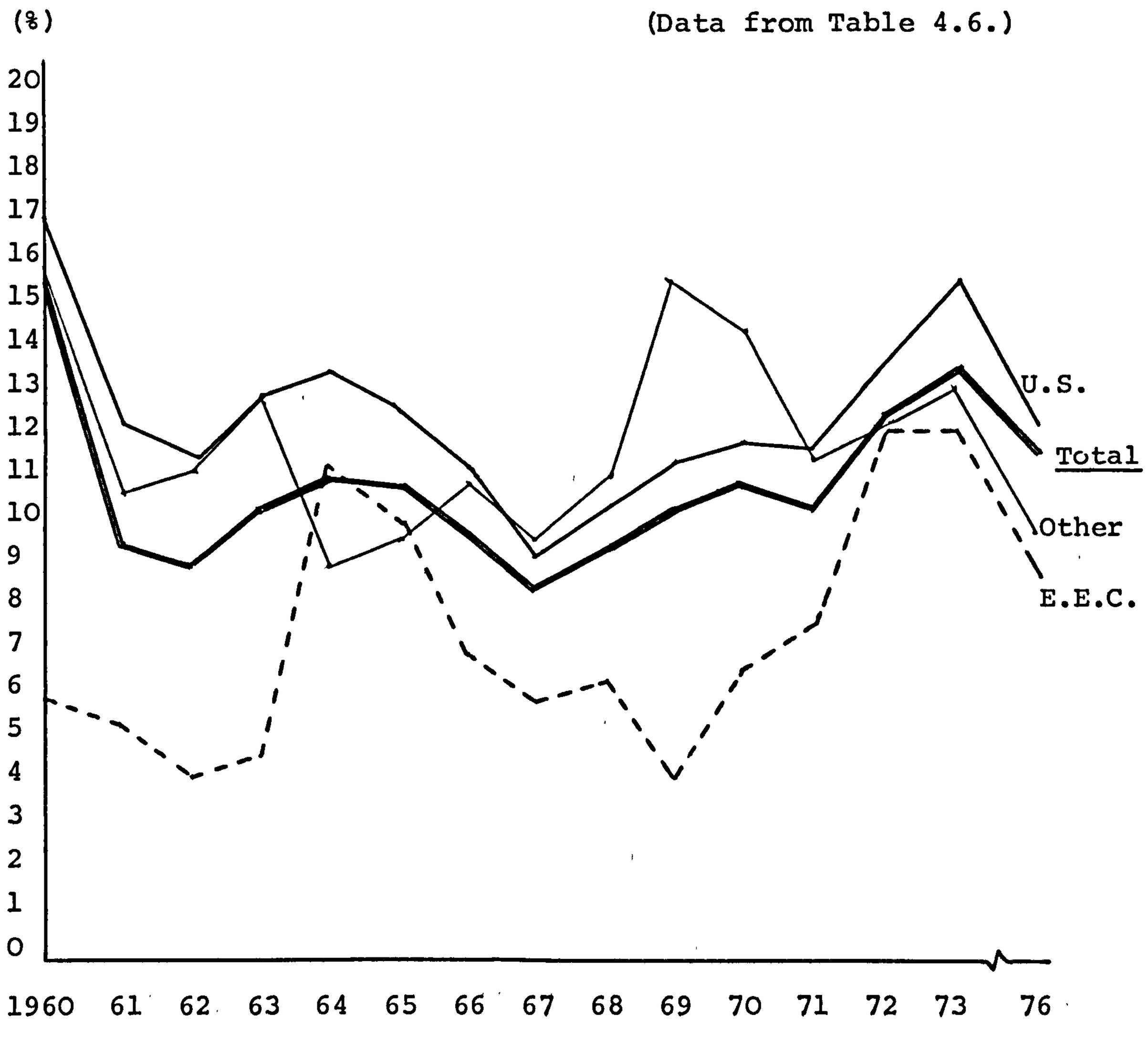
Amongst others, Steuer (1973) and Dunning (1970a and 1978) have compared the rate of return on D.F.I. with that of U.K. companies. Both found evidence that foreign owned companies have higher rates of return. However, because of the differential industrial spread of D.F.I. to that of U.K. companies, the higher rates of return might simply reflect greater concentration of activity in high profit industries. In order to observe such a relationship Table 4.7. demonstrates variations in such returns subdivided by industry.

Here the foreign affiliate outperforms the U.K. company in nearly every sector, however, the size of this advantage varies greatly by industry. In general, therefore, foreign owned affiliates tend to be more profitable than indigenous companies, and U.S. owned firms have always been seemingly more efficient, in rate of return terms, than other sources of investment, albeit the gap is closing.

The table below shows that the performance gap between

FIG. 4.1.

Average Rates of Return to Foreign Investors in the U.K.: by Country, 1960-76.



Source: Author's construction from Table 4.6.

British owned companies and those under foreign control, has in fact widened in some cases, but narrowed in certain industries, namely Chemicals and Allied Trades, and more markedly in Metal Manufacturing where the British sector convincingly outperformed the foreign affiliates in 1973. In the E.I. the differential rate of return has remained fairly constant, possibly with a slight acceleration of the situation in absolute terms, with a 1% difference, widening into one of 4% by 1973. Given that variations in profitability, therefore, do occur from industry to industry, could it be that foreign companies within the E.I. merely locate more successfully in the more profitable sectors of the industry.

Studies undertaken in the U.K. (Steuer 1973), Australian (Brash 1966), and Canadian (Safarian 1969),manufacturing industries, suggest that most of the differences which exist are due more to a higher return being earned within particular industries, rather than the concentration of foreign investment in the more profitable sectors of the economy. If this holds for the E.I. as an individual unit, then it has ramifications for our study, in that performance by foreign affiliates, must be directly related to their position in the industrial structure, and therefore changes in one will lead to changes in the other. If, however, there is evidence to support the contention that these affiliates do seek out more profitable sectors of the E.I. with greater accuracy than British owned companies, then this too will affect their role in the changing structure of the industry. Thus we can have a two - fold structural effect, by locating in the more profitable sectors of the E.I., they will help accelerate the development of

TABLE 4.7.

Average Rates of Return* : by Industry, 1965 - 73.D.F.I. and U.K. quoted companies.

Date	E.I.	Food Drink Tobacco	Chemicals & Allied.	Metal Mfg.	Mech. Eng.	Vehicles	Other Mfg.
1965 - D.F.I.	10.3	12.3	17.2	6.5	13.1	10.9	9.6
U.K. Quoted	9.8	10.8	9.2	8.6	7.2	11.8	10.0
1966 - D.F.I.	9.6	9.8	13.2	4.4	10.1	4.4	7.8
U.K. Quoted	7.3	7.1	5.7	3.4	5.2	6.4	6.4
1973 - D.F.I.	17.9	16.4	16.3	5.3	20.7	10.9	N/A
U.K. Quoted	13.8	12.3	14.3	14.0	11.5	9.3	10.2

*Percentage Return after taxation.

Reproduced From;

M.D. Steuer et al - The Impact of Foreign Direct Investment on the U.K., Department of Trade and Industry H.M.S.O. 1973.

such specialisms. Secondly, if the individual companies are more efficient, this will sponsor a reallocation of resources at a firm level.

It is possible to list several further characteristics of foreign investment which affect the performance of those affiliates. The age profile of the investment is one of these factors. Board of Trade statistics reveal that there appears to be an inverse correlation between the date of establishment and rate of return. This is confirmed by the Reddaway study (1967/8) and also D.T. Brash in his study of U.S. enterprises in the Australian manufacturing industry (1966). By contrast, U.S. investments in the U.K. set up between 1946-55 seem to do better than those established before or since. However, the bulk of foreign investment in the E.I. took place either pre-1946 or post-1955, both in numbers and value, and as this sector still outperforms the British owned affiliates, and indeed the E.I. outperforms many other industrial sectors, this can probably be discounted as an important factor in this industry.

The size of the investment also appears to have some affect upon the profitability or otherwise of the individual affiliate. Department of Industry statistics (1968, 1970 and 1973) show that during the 1960's over half the large firms* in U.K. industry under foreign ownership made at least a 10% return on capital. The same kind of figure also held for the

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* Over £5 million in Net Assets.

next largest sector, the £1 million - £5 million net asset worth. However, firms with less than £0.5 net asset value found it harder and harder to be profitable, and these companies generally split, on efficiency grounds, into one group who made a very reasonable 20% + on their operations, and a larger number who returned less than 5% or made losses. Turning to the individual industrial sectors, there would appear to be further evidence of industry specific economies of large scale investment. Only the large scale plants of the Vehicle sector showed a greater inclination towards large scale production, and the E.I. had 78.5% of her foreign owned net asset worth in the hands of companies with net assets greater than £5 million. (Industrial average 63.1%). The E.I. has the lowest percentage of affiliates within the £1 million to £5 million group of any industry, and a larger range of smaller, more specialised companies. It would appear, therefore, that foreign affiliates fall into two distinct size classes for the main part; a sizeable group of large scale companies with over £5 million net value, and another sizeable group of small, specialist companies, probably under direct parental sponsorship, or filling a narrowly defined market position. This is really to be expected. In the E.I. there are distinct advantages of large scale production because of the nature of the industry, and the need for high levels of expenditure either upon labour in the assembly orientated sector of the industry, or the needs for extensive R&D facilities in the high technology sectors. Large scale investment enables the producer to spread his risk of failure. The presence of large parent companies allows for the provision of internationally specialised

expertise, and the internalisation of markets on an international scale, give affiliates a distinct comparative advantage over indigenous industry. These affiliates can make use of access to technological skills, financial and management services and more easily accessible market outlets. The size structure of these investments will obviously affect the overall structure of the E.I., both directly and by domestic reaction, in terms of the distribution of market size and power, and therefore the effects of differing sizes of foreign owned and domestically owned affiliates will be examined later in the study.

Other factors can be introduced which will affect the definition of profitability, such as the differences in accounting and pricing policies, the payment of royalties, fees and services which give rise to transfer pricing practices in the multinational firm, and the defensive or aggressive nature of the investment decision. However, the bulk of such arguments generally apply equally to both sides, often indeed, favouring the foreign affiliate. (See Dunning 1966).

Therefore, in conclusion, there is some evidence that the foreign owned affiliate is more profitable in rate of return terms than indigenous competitors. Table 4.8. shows that this investment is not apportioned by total industry size, nor is it directed to the most efficient industries, i.e. net profit as a return on net assets. (None of the Spearman rank order correlation coefficients proved significant.) Also the foreign participants outperform the British companies in most industrial sectors, which supports the contention that for some reason or combination of reasons, foreign firms obtain

TABLE 4.8.

Main Areas of Investment by Foreign Parents - 1976. (Manufacturing).

Industry.	(Rank)* Total Net Assets.	(Rank)* Foreign Owned (Total £m).		(Rank)* Efficiency (a)	(b)
Mechanical Engineering	4	1	(1144.4)	5	4
Electrical Engineering	3	2	(757.5)	6	2
Food/Drink/Tobacco	1	3	(747.6)	9	1
Chemicals	2	4	(709.6)	12	3
Motor Vehicles	8=	5	(472.0)	14	6
Metal Manufacturing	8=	6	(294.4)	13	9

*Ranking in List of all Manufacturing Industries. (14 Industries).

(a) Net Profits/Net Assets.

(b) Gross Profitability.

Source: Calculated from -

Department of Trade and Industry - Business Monitor, Company Finance, (1977). H.M.S.O.

Business Monitor M4, Overseas Transactions, (1977). H.M.S.O.

National Income and Expenditure (Blue Book), (1977). H.M.S.O.

Census of Production, Provisional Results, 1977, H.M.S.O.

higher rates of return on capital than do indigenous companies.

This also holds for the E.I., and two possible explanations are available. A differential distribution of the location of foreign owned subsidiaries in the high growth sectors of the industry, or a higher degree of efficiency within the individual foreign firm. These two possibilities are examined later.

4.1.4. Method of Entry.

Given the decision to service the U.K. market by host country production facilities, rather than by export, or portfolio investment, the choice is limited to three alternatives. Namely by the acquisition of existing production facilities, a green field venture, or a joint venture. Naturally each of these alternatives will have differing effects upon industrial structure at an aggregate level, and also within the individual industrial sectors.

The nature of the investment 'package' will also determine the exact role of the subsidiary, within the market, and severe rationalisation, for example, after a takeover can actually lead to a contraction of the overall market size. Any attempt to determine the exact nature of the change means that assumptions have to be made as to what would have happened in the absence of such investment. Saying that the setting up of a new establishment will expand the industry assumes that the increased sales could not have been supplied by the companies already present, or even more contentiously, assumes that the new company's market share has not been taken from the indigenous companies. However, we can, probably quite

rightly, assume that the new firm must help increase the efficiency of the industry, in that if it were not so, then the new firm would soon lose its market share to those companies already present who were more efficient.

The evidence presented by Steuer (1973) indicates that foreign entrants prefer the green field venture (61.6% of companies contacted had used this method of entry) as the vehicle of entry, rather than the takeover (24.2%), with the joint venture not being considered a viable proposition by the large majority of foreign entrants (10.4%). This would suggest that in the majority of cases, the foreign affiliate is thought to have nothing in the way of know-how to gain by acquisition of a British company, or that there is no attractive British company available. Dunning (1970a)has noted, however, that in recent years the trend seems to be away from this preference for the new establishment method of entry, and more in favour of the takeover as the way of gaining production facilities in the U.K.. Since 1969, the Department of Trade* has published separate data on the acquisition of U.K. companies by all foreign concerns. It is noticeable from such figures that the incidence of the takeover of domestic firms by foreign parents is on the increase. Another exception would appear to be the entry of large scale companies, or more often, the immediate step towards expansion once in the U.K., where the takeover or merger seems more popular. Certainly, having established their foothold, the foreign sector are more merger active and significant changes in production levels or direction of activity are often initiated.

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*"Trade and Industry" - (Various Issues)

Utton (1971/2)* has already noted the significance of these mergers in the changing structure of U.K. industry, in particular when linked with the changes in concentration in various industrial sectors. It can be argued that it is here that the real effect of D.F.I. merger activity is felt. Initial entry by foreign affiliates using the takeover as a vehicle for entry causes no immediate change in structure, only ownership, whilst the real structural effect stems from such activity by firms once established in the U.K.. Therefore, it is noticeable that the green field venture method of entry, and the merger method of expansion once established, are the two most structurally disruptive methods of entry and expansion, and that this is exactly the pattern of foreign direct investment.

Obviously the level of equity ownership by foreign parents in their affiliates is heavily determined by the method of entry, thus the next section relates to the ownership structures resulting from the varying methods of entry and sources of investment.

4.1.5. Ownership Structure.

The new establishments are, naturally, almost always wholly owned, and the joint ventures are biased towards 50% ownership. It is noticeable that 84.2% of these companies have 50% or more of the equity in the hands of the foreign partner, but a large share of this is probably 50-50 ownership. A rather more accurate figure is that 43% of these

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* Amongst many others (see section 5.3.)

joint ventures have more than 60% of the equity in the hands of the foreign parent.

In the case of takeover of British companies by foreign parents, 84% of such investment is aimed at 90-100% of the equity of the new subsidiary, and hardly any parents are prepared to accept 60% or less. In practice, therefore, takeovers establish a pattern of foreign ownership only marginally less complete than new establishments.

It is frequently suggested that the greatest ownership/control is exerted in the modern world 'science based' or 'high technology' industries. Evidence presented by several writers would tend to dispel this hypothesis. Except for the rubber goods industry, the pattern of ownership is fairly stable over all industries. The postal survey of Steuer (1973) supports the earlier Board of Trade figures, and only the Textile and Rubber industries have a smaller percentage of their equity with 100% control in the hands of the foreign investor than the E.I., but the E.I.'s figure of 72.4% is still very close to the mean of 74.7%. However, even if the total D.F.I. average is not significantly different than that of total U.K. industry, we could still see some variation between the source countries.

The U.S. parent holds complete ownership of its affiliate in 70.1% of the cases, and holds a controlling interest of 50% or more in 88% of cases. This compares favourably with the E.E.C. domiciled parent which exhibits a significantly lower tendency to own over 50% of the equity, however the remaining sources show an ability to obtain a controlling interest in their affiliates to an even greater extent than the U.S. par-

ent. It must be remembered, though, that two of the largest contributors to this sector are Switzerland and Canada, the parents of which are often not the ultimate owner, and a large degree of holding company activity (particularly of U.S. origin) is in evidence. (Table 4.9.)

When takeovers are isolated, a similar pattern is observed, but the U.S. takeovers tend to be almost entirely of a 100% ownership type. (The data for the other nationalities could be unreliable due to the small sample size - Steuer 1973).

There is some feeling that larger affiliates, since they involve a higher capital risk, tend to be more tightly controlled, and have a greater proportion of their equity owned by their parents. The evidence suggests that whilst affiliates with asset worth greater than £1m. in most, if not all, cases have controlling interest in the hands of the parent, this is not always total ownership. In fact fewer companies here seem to be totally owned than in the smaller groups. Foreign ownership is highest for medium sized affiliates, and the branching off of ownership for the very large affiliates could perhaps represent risk spreading.

It has already been seen that the E.I. has industry specific characteristics that make large scale establishments attractive to the participants, therefore, the conclusion that larger firms hold fewer total ownership positions than in smaller affiliates fits in with the observation that the overall figure for total control by parents in the E.I. is lower than that for most other industrial sectors.

One final determinant of the level of equity holding, is the size of the international network of affiliates, under

TABLE 4.9.

Percentage Equity Owned by Parent against Nationality of Parent.

(1) All Companies.

% Equity Owned	U.S.	Canada	E.E.C.	E.F.T.A.	Switzerland	Sterl. Areas.
Less than 50	11.8	9.5	17.0	17.1	4.6	12.5
50 - 90	11.1	14.3	17.0	35.7	22.7	25.0
90 - 99	5.9	4.8	17.0	-	22.7	-
100	70.1	71.4	49.1	57.1	50.0	62.5

(2) Takeovers Only.

Less than 50	1.3	14.3	28.6	-	-	N/A
50 - 90	12.9	28.6	-	25.0	33.3	N/A
90 - 99	3.9	-	14.3	-	-	N/A
100	82.1	57.1	57.1	75.0	66.6	N/A

Reporduced From;

M.Steuer et al - The Impact of Foreign Direct Investment in the United Kingdom. Dept. Of Industry H.M.S.O. 1973.

the foreign parent. Again the evidence suggests that large networks tend to go for a higher percentage ownership than smaller ones, but the results are inconclusive and usually based on inadequate sample sizes.

It is also noticeable that parents investing in the E.I. are attracted more to the affiliate as opposed to the associate or trade investment relationship. This is not necessarily the case with British parents, who make far wider use of the latter two types of association, and one may speculate that this would afford a lesser degree of control than that present in foreign firms.

One further point on ownership is that most foreign parents tend to be specifically related to the E.I., often Electrical or Instrument specialists themselves. Once again, whereas the large U.K. companies such as G.E.C., Plessey, Thorn etc. are indeed almost totally involved in the E.I., large amounts of equity in the E.I. are owned by non-Electrical and Instrument Engineers, which could well lead to lack of expertise and parental guidance available to the affiliate under British ownership compared with that available to the foreign owned affiliate. It would also appear that foreign ownership is remarkably stable, with 82.2% of respondants to the Steuer study replying that after entry they had experienced no change in the distribution of equity.

The companies referred to are not all massive multinational giants, with affiliates dwarfing the surrounding competition, however, Dunning has calculated that in 1971 under 17% of U.S. affiliates (those greater than £15m. sales revenue) control 78.8% of total sales of U.S. affiliates.

So we have on the one hand a small number of very powerful parents, and their complex chains of associated companies, and on the other hand a larger number of small and medium sized companies and their affiliates. It is evident, however, that the tendency is for a move towards the larger affiliate, both by domestic expansion and the increased size of the initial entry. If this is to be the case, then the structure of the E.I. is certain to be affected.

4.1.6. Implications for Macro-level Changes in Structure.

The stock of D.F.I. in the E.I. is growing far more rapidly than the average for the U.K. industrial sectors. Foreign investors seem attracted to the history of success and growth of the E.I., coming into the industry in above average numbers. Their presence will help attract resources into the E.I. to stimulate further growth, and is an indication that foreign parents anticipate future success of the industry. The growing contribution of the E.I. to the U.K. economy can only be accelerated by such foreign interest. The slight variation in the real value of investment over the past two decades demonstrates the sensitivity of foreign investors to the health and potential of the U.K. economy and industries such as the E.I. in particular.

The bulk of foreign direct investment in the E.I. originates from the U.S., but a disproportionately high percentage also arrives from the E.E.C.. The contributors of the varying geographical sources of such investment have changed over the years, and if we find later that differing sources of D.F.I. display different operating characteristics, then

this too could have some structural impact.

In general, evidence has been presented to suggest that foreign investors have been more profitable than the indigenous companies, and that this is not merely a reflection of location in the more profitable industries. Indeed, the data demonstrated that foreign affiliates generate higher rates of return in almost all the U.K.'s industries. However, this does not necessarily imply that the individual companies are more efficient. It could be that the foreign affiliate locates in the more profitable, fastest growing sectors of each industry. The example of the E.I. is examined in the next section, but whatever the cause of the greater levels of efficiency, the higher rates of return earned by E.I. companies will lead to the rapid expansion of productive capacity in the industry. The level of entry barriers and the distribution of market power will also be affected. It is possible that the higher rate of return is a greater appreciation of an optimum product and/or process structure. This will be examined in Chapter 5.

The affiliates of E.E.C. based parents are shown to be the most efficient, and any change in the percentage of investment originating from this and other sources will affect, therefore, the above measures of structure. The foreign investors, in particular the U.S.-owned affiliates, generally divide into large companies (net asset value in excess of £5m.), and smaller specialised firms. This will mean that the penetration of the E.I. by such affiliates can be expected to lead to exploitation of economies of scale, higher levels of productive capacity, and redistribution of market power on the

one hand; and some modification of the product and process structure on the other.

Finally, the method of entry and expansion by foreign affiliates is structurally disruptive (namely, entry by green field venture expanding the numbers of firms with the industry, and growth externally by takeover and merger once inside the E.I. leading to further structural pressures), and the close control of foreign affiliates by their parent often means the installation of the overseas business ethic in the affiliate. (See Steuer 1973). Should the foreign parent exhibit operating characteristics of a different nature to those of the host country's business sector, then some structural modification could possibly occur.

All of these characteristics of foreign owned companies in the E.I. will affect the industry's role within the economy, attract resources, accelerate growth and generally bring some pressure to bear upon the existing industrial structure leading to a rationalisation of the above variables.

It was noted in Chapter 3 that the E.I. had experienced an increasing change in structure since the second world war, with rapid growth of productive capacity; increasing concentration of market power; greater product specialisation within the individual company; greater levels of vertical integration; and entry barriers becoming more prohibitive to potential entrants.

Chapter 3 demonstrated a significant correlation between the modelled variables comprising industrial structure and the level of foreign penetration. It seems possible therefore, that its presence acts as a stimuli for structural change and

industry rationalisation. This could be initiated by the distribution of investment throughout the minimum-list-headings of the E.I., i.e. the destination of investment.

4.2. The Destination of Investment.

This section examines, firstly, the distribution of D.F.I. within the E.I., and secondly compares the structural characteristics of the individual minimum-list-headings with the level of foreign penetration, in an attempt to demonstrate the Industry-level pressure for structural change.

4.2.1. D.F.I. in the Minimum-List-Headings of the E.I..

Table 4.10 below, demonstrates clearly that the share of industry sales in many sectors of the E.I. controlled by foreign affiliates is substantial. The conclusion can also be drawn that the number of these headings within which foreign affiliates hold a dominant position (more than 50% of total market sales), is growing.

In 1963 only in the manufacture and sale of Valves and Tubes, and Vacuum Cleaners, did foreign affiliates control over 50% of the market. By 1968 they had added Washing Machines to this list, by 1971 they held a dominant position in ten such sectors, and by 1973 in fourteen.

Investment by foreign parents has led to their affiliates holding a significant share of nine other areas, and at both these levels of market penetration they have displayed a marked preference for the areas of Electronic Equipment,

TABLE 4.10.

Estimated Shares of Sales in E.I. by Foreign Affiliates 1963 - 73.

DOMINANT (Over 50%).

1963	1968	1971	1973
Vacuum Cleaners	Vacuum Cleaners	Vacuum Cleaners	Vacuum Cleaner
Valves and Tubes	Valves and Tubes	Valves and Tubes	Valves & Tubes
Washing Machines	Cameras	Photocopying Equipment	
	Photocopying Equipment	Electric Shavers	
	Refridgerators	Sparking Plugs	
	Electric Cash Registers	Refridgerators	
	Calculators	Electric Cash Registers	
	Sparking Plugs	Calculators	
	Computers	Films	
	Electric Shavers	Computers	
		Printing & Typesetting Apparatus	
		Sewing Machines	
		Electronic Office Machines	
		Portable Power Tools	

SUBSTANTIAL (30%-50%).

Watches & Clocks	Watches & Clocks	Watches & Clocks	Watches & Cloc
Cables for Telecommunication	Line Apparatus	Electronic Measuring and Testing Equip.	Washing Machine
Line Apparatus	Cables for Telecommunication	Portable Power Tools	Cameras
Washing Machines	Passive Components	Washing Machines	Electronic Measuring & Control Instru.
Refridgerators	Record Players	Cables for Telecommunication	Cables for Telecommunica-tion.
	Data Processing		
	Refridgerators		

Table 4.10. cont...

1963	1968	1971	1973
		Passive Compon-ents	Line Apparatus
		Record Players	Passive Components
		Data Processing	Record Players
		Line Apparatus	Data Processing

REASONABLY IMPORTANT (15%-30%).

Photographic Equip-ment	Surgical Instruments	Radios	Industrial Refridgeration Equipment
Telephone and Telegraph	Optical Instruments	Radar	Ventilation Systems
Passive Components	Measuring Equipment	Analytical Instruments	Plus 1971 list, but
Gramophone Records	Control Systems	Plus 1968 list, but	Less - Control Systems
T.V.	Heating Systems	Less - Measuring Instruments	
Radios	Electrics for Cars		
Record Players	Photographic Equipment		
Radio Communica-tions	Telephone & Telegraph		
Medical Electronics	Gramophone Records		
	T.V.		
	Radio Communications		
	Medical Electronics		

SOME INTEREST (up to 15%).

(7) Heating Systems	(14) Analytical Equipment	1971 and 1973 data
(11) Surgical Equipment	(8) Motor Control Gear	Not Available

Table 4.10. cont...

1963	1968	1971	1973
(6) Motor Control Gear	(3) Traction Motors	1971 and 1973 data	
(5) Traction Motors	(5) Cables for Power	Not Available	
(7) Data Processing	(11) Radio	but certainly less	
(10) Radar	(6) Radio Communications	Analytical Equipment	
		Radios	
(4) Cookers	(11) Radar	Radar	
(13) Electrics for Cars	(2) Cookers		
(4) Batteries	(6) Batteries		
(7) Lighting Equipment	(1) Lighting Equipment		

Reproduced From:

EAG study by J.H. Dunning et al.- United States Industry in Britain , Financial Times 1973

Table 5 (Vol 13) Census of Production, 1968, Department of Trade and Industry, H.M.S.O.

Photographic Instruments and Electrical Consumer Products.*

The majority of these investors have been prepared to commit large scale capital expenditure along with the financing of extensive R&D facilities, and have grown along with the market, often from its earliest development.

Those foreign affiliates which combine to obtain a 15%-30% share of their respective markets cover a further 12 sectors, and again show a distinct attraction to specialised areas within the rapidly expanding, high technology fields of Electronic Instruments and Systems, and Consumer Products. Only in the less significant holdings with market shares of less than 15% is there a move into the more genuinely heavy Electrical Engineering sector, often these stakes being minimal indeed.

It is also noticeable that the trend is for an increasing market share to be accounted for by foreign owned companies, and once obtained these stronger market positions are not readily relinquished. Significantly only two sectors, cameras and the production and sale of washing machines, have fallen from a stronger market position to a weaker one. (The latter is probably due to the cheap import of Italian made machines, largely by the Electricity Board, rather than competition from British based firms).

The growth of foreign participation up to 1973 has been

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* Of these 23 areas, only three; namely, Electric Portable Tools, Cables for Telecommunication, and Line Apparatus, could be classified as Electrical Engineering, and a large proportion of the output of the first of these will be for domestic consumption.

TABLE 4.11.

Proportion of Sales by Foreign Affiliates in 33 Sectors of the E.T.. 1963 and 1968.

Sector.	1963(%)	Rank	1968(%)	Rank
Photographic Equipment	23	8	29	11
Watches and Clocks	42	5	43	5=
Surgical Instruments	11	18	22	14=
Optical Instruments	N/A	-	22	-
Measuring Instruments	N/A	-	25	-
Analytical Instruments	N/A	-	14	-
Control Systems	N/A	-	22	-
Motor Control Gear	6	23	8	21
Traction Motors	5	24	3	25
Cables for Communication	44	4	44	4
Cables for Power	N/A	-	5	-
Telephone and Telegraph	21	9=	22	14=
Line Apparatus	39	6	40	7
Valves and Tubes	54	2	56	2
Passive Components	17	13	32	9=
Gramophone Records	16	14=	23	13
T.V.	20	11	28	12
Radio	16	14=	23	13
Record Players	19	12	39	8
Data Processing Equipment	7	20=	32	9=
Radio Communications	21	9=	6	22=
Radar and Navigation Equipment	10	19	11	19
Medical Electronics	16	14=	16	16=
Cookers	4	25=	2	24
Heating Systems	7	20=	16	16=
Refridgerators	37	7	43	5=

Table 4.11. cont...

Sector.	1963 (%)	Rank	1968 (%)	Rank
Vacuum Cleaners	83	1	79	1
Washing Machines	46	3	50	3
Electrical Equipment for Vehicles	13	17	16	16=
Batteries	4	25=	6	22=
Lighting Equipment	7	20=	1	26
Spectacles	N/A	-	12	-
Other Cables	N/A	-	13	-

Source: Department of Trade and Industry - Report on the Census of Production, 1968. H.M.S.O.

steady, and equal on all fronts. Evidence from a comparison of the percentage market share of a comparable 26 sectors as shown in Table 4.11. for the years 1963 and 1968, demonstrates a Spearman Rank Correlation Coefficient of 0.88 (Significant at the 0.01% level) which would suggest that the pattern of investment is not changing significantly, and that the rate of growth of the market share held by foreign participants is equal in all sectors.

By 1973, foreign affiliates accounted for one third of the market sales in more than half of the industrial sectors comprising the E.I., and also held a substantial interest in the major part of the remainder.

However it is clear that foreign affiliates have penetrated some minimum list headings to a greater extent than others. It can be surmised, therefore, that establishments under foreign ownership display a differing distribution throughout the specialisms of the E.I. to those under domestic ownership.

To test the hypothesis that foreign firms are attracted to certain areas of the E.I. in above average proportions, three types of analysis were used. Firstly the proportional distribution of establishments under foreign ownership throughout the industry was measured, and the results portrayed in Figure 4.2. by means of a multiple bar chart. This demonstrates visually the imbalance of such investment in the various sub-headings. Admittedly this diagram shows simply the number of establishments as the yardstick of measurement, however the discrepancies are too large to be simply the result of a differential firm size distribution.

Secondly, a Chi-squared analysis tested whether or not foreign owned establishments in general were distributed in a significantly different manner from British owned counterparts.

Thirdly, an analysis of variance was used to test the validity of the earlier visual presentation, and to confirm that the three principle elements of the foreign group, namely; U.S., E.E.C., and other investors, were attracted to differing areas.

Figure 4.2. shows that U.S. owned establishments are largely responsible for the overall distribution of foreign owned affiliates, which is only to be expected given their large share of the total number in the E.I. (71%). Only in the Watch and Clock sector was the U.S. share apportioned significantly differently from both the other two sources of investment (here all foreign investors were of U.S. origin). However, their total market dominance of the foreign sector in all areas meant that the U.S. distribution of establishments across all sectors of the E.I. was nearly identical to that of total foreign establishments. Variations do occur, however, and can be seen in the figure below. A low level of investment in Watches and Clocks by both E.E.C. and other (non-U.S.) investors is the only common decision. In many other sectors the pattern of investment is distinctly at variance.

The E.E.C. sources of investment prefer involvement in Insulated Wires and Cables, Broadcast Receiving and Sound Reproducing Equipment, and Miscellaneous Electrical Goods, all of which are shunned by investors from other (non-U.S.) sources,

FIG 4.2.

Distribution of Foreign Owned Establishments in the E.I.; by sector*, 1968.

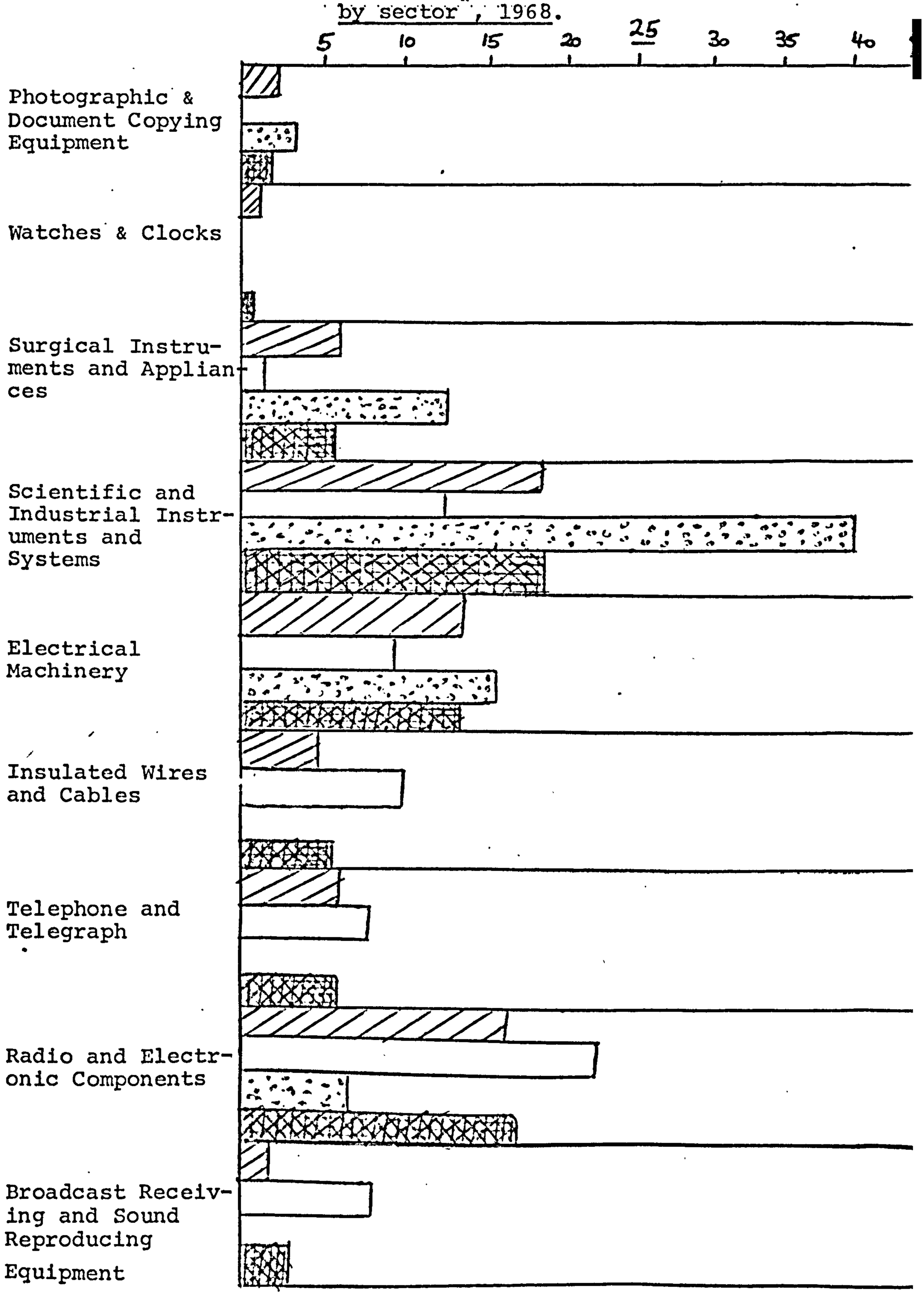
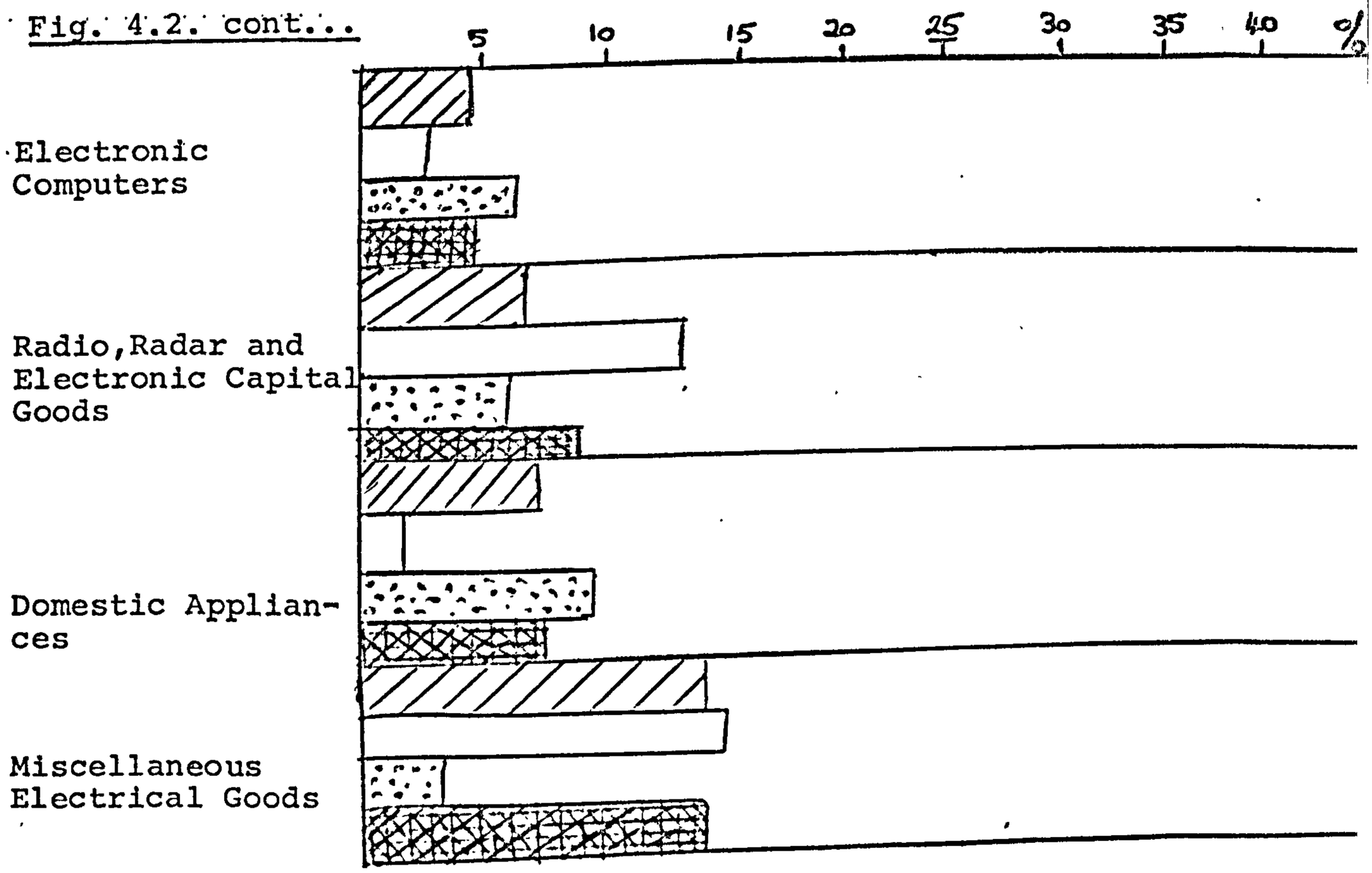


Fig. 4.2. cont...



Key.

U.S. Owned Companies

E.E.C.

Other.

Total

Scale: 3mm. = 1%

*Graph denotes % of total establishments from each group in the various sectors.

Source : Calculated from S.I.C. listing of firms classified to minimum-list-headings of the E.I., Census of Production 1968 HMSO.

along with Telephone and Telegraphic Apparatus. The E.E.C. also prefer Radio and Electronic Components, and Radio, Radar and Electronic Capital Goods, both of which have only average interest shown in them by the non-E.E.C. sources. Meanwhile, the E.E.C. has little involvement in Photographic and Document Copying Equipment, Surgical Instruments and Appliances, and Domestic Electrical Equipment, whilst other (non-U.S.) investors have distinct preference for Scientific and Industrial Instruments and Systems, Surgical Instruments and Appliances, and Electrical Machinery. This suggested a distinct relationship between the differential distribution of establishments across the E.I. and their geographical origin.

An X^2 test of the hypothesis that the British owned sector did not deviate significantly from that of the overall distribution of the E.I. proved, as expected, to be valid with a result of $X^2 = 8.9925$ (with 12 d.f. not significant).

A remaining question to be answered concerned the overall distribution of establishments under foreign ownership. Namely, whether or not they were engaged in the minimum-list-headings in a comparable manner to that of the U.K.-owned operating establishments.

The above test was repeated upon the null hypothesis that ownership and distribution were not related. This was significantly disproved with a result of $X^2 = 81.426$ with 12 d.f. significant at the 0.1 level. This leads us to the conclusion that establishments under foreign ownership are distributed throughout the E.I. in a significantly different manner to those under British control. From the results it was noted that the major contribution towards this total deviation,

derived from a significant under-representation of foreign owned firms in the Electrical Machinery sector, and an even more significant over-representation in Insulated Wires and Cables. There was also a noticeable attraction in greater than expected numbers to the fields of Radio and Electronic Components and Electronic Computers.

The conclusion that the different sources of foreign investment do not move equally into all minimum list headings of the E.I. is supported by an analysis of variance which proved significant at the 0.1 level (F= 20.034 with 2 and 24 d.f.). It must therefore be assumed that the D.F.I. group is not homogeneous, and that variations in investment patterns do occur.

In all of these cases the greatest responsibility must be laid at the door of the U.S. parents, if only because of their dominance in all markets. Therefore the real question concerns the effect of the remaining sources of investment.

In the first sector the three major sources have all roughly the same percentage of their establishments located there, the E.E.C. being the smallest with only 9.6% of its total number. The 'other' sector had the greatest percentage present (15.6%) but this is a share of an absolutely lower total (the other sector has only 8.1% of the total number of foreign owned establishments).

The E.E.C. contributes a large percentage of companies in Insulated Wires and Cables, but throughout we must also stress the influence of the U.S. owned firms because of their overall dominance of numbers. There were no non-E.E.C. and non-U.S. companies. Radio and Electronic Components has a

large contribution from E.E.C. countries, and only 6.3% of the total amount of establishments were classified to the 'other' group.

Finally in Electrical Computers the U.S. firms have market dominance through I.B.M. and several other major computer specialists, but the overall figures are small, probably because in 1968 this industry was still very much an expanding one. The sources of D.F.I. can be segregated to denote the preferences shown by each.

The U.S.-based parents want to participate in the production and sale of Scientific and Industrial Instruments and Systems, Radio and Electronic Components, Miscellaneous Electrical Goods, and Electrical Machinery (though here the stake is still small relative to total market size).

The Other-based parents are mainly attracted to Scientific Instruments and Systems, Surgical Instruments and Appliances, and Electrical Machinery.

The E.E.C- based parents invest most readily in Radio and Electronic Components, the rest of their participation being spread fairly evenly, except for a significant lack of interest in Document Copying Equipment, and Watches and Clocks.

Thus the various sources of investment seek differing minimum list headings of the E.I.. However, such figures can be misleading in that the percentage involvement will vary with the size of the sector. Figures for the market share controlled by foreign owned affiliates are therefore more accurate. However, the earlier data, are supported by such figures. For example, 32.3% of establishments in Insulated Wires and Cables come under foreign ownership, as do 26.6% in Electronic Computers and 20.9% in Radio and Electronic Compon-

ents. Whilst only 14% of total E.I. establishments were under foreign control in 1968. This supports the conclusion that such sectors attract disproportionate numbers of establishments from the various sources of investment.

This imbalance of interest will add to possible pressures for a changing structure of the E.I. brought to bear at an Industry-level.

4.2.2. The Industry-Level Effects of D.F.I..

It is now possible to identify a distinct pattern of foreign affiliate activity within the minimum-list-headings of the E.I., differentiated by the geographic origin of the parent. Attention is now turned to the possible reasons for, and effects of, such an investment pattern.

D.F.I. is attracted to three major sectors, namely Insulated Wires and Cables, Radio and Electronic Components, and Electronic Computers, whilst at the same time being significantly underrepresented in the Electrical Machinery sector. Even deflating the figures for establishments by the average firm size in each of these sectors does not fully explain the differential distribution. The three former headings all fall under the general area of electronics (cables for communications is the main area of production by foreign affiliates in Insulated Wires and Cables), and this supports our earlier observation that the highest percentage involvement (by sales) by foreign investors was in Electronics and Photographic Instruments, with a distinct avoidance of the Electrical Machinery heading.

If a comparison is made with the distribution of sales

in the E.I. it is surprising to see that the Electrical Machinery heading is the largest individual sector with 18.1%, whilst Radio and Electronic Components make up only 10% of total E.I. sales, and Electronic Computers less than 3.5%. Only the attraction to the Insulated Wires and Cables sector seems understandable with its 11.4% of E.I. turnover. However, turning to the development of these specialisms it is noticeable that whilst still being the largest individual sector, Electrical Machinery is in long term decline as an industry force. On the other hand, the Cables for Communications sector, along with Electronic Computers and Radio and Electronic Components are amongst the most successful and rapidly expanding areas of the industry. Therefore it would seem reasonable to suggest that the foreign affiliate seeks the better performance areas of the E.I. in which to operate.

Statistical analysis is needed to support this contention. In Chapter 3, the structural characteristics of the E.I. were introduced, and if the existence of an industry level pressure for a change in this structure is to be proven, then some relationship between the structural characteristics of the individual minimum headings and the pattern of D.F.I. as suggested above, should be in evidence.

Table 4.12. presents the results of a ranking of the minimum-list-headings of the E.I. according to various structural characteristics that they can be seen to display. In an attempt to highlight the foreign investors ability to foresee potential development in these sectors, and to relate the eventual changes to the prior presence of D.F.I., the figures shown compare the level of investment in 1968 to the result-

TABLE 4.12.

The Ranks of Minimum List Headings' Structural Characteristics and the Presence of D.F.I..

Sectors	Ranks				
	D.F.I.	Entry Barriers[a]	Size[b]	Vertical Integration[c]	Diversification[d]
Photographic Equipment	12	6	12	12	13
Watches and Clocks	13	13	13	11	12
Surgical Instruments and Appliances	8	12	11	7	8
Scientific and Industrial Instruments and Systems	1	3	2	3	5
Electrical Machinery	4	2	1	2	3
Insulated Wires and Cables	10	8	5	10	11
Telephone and Telegraph	9	9	10	9	10
Radio and Electronic Components	2	1	3	4	4
Broadcast Receiving and Sound Generating Equipment	11	10	7	13	9
Electronic Computers	7	11	8	8	7
Radio,Radar, and Electronic Capital Goods	5	7	9	6	6
Domestic Appliances	6	4	6	1	2
Miscellaneous Electrical Goods	3	5	4	5	1

a. An average of three measures - Economies of Scale
R & D Costs
Set up Costs

b. Sales Turnover

c. Index of Vertical Integration

d. Index of Diversification

Sources : Census of Production H.M.S.O. (various issues)
Input- output Tables, H.M.S.O. (various issues)
Company Accounts (various)
Dept. of Trade estimates of D.F.I. rankings.

ing structural characteristics six years later in 1974.

From these data Spearman Rank Order Correlation Coefficients were calculated.

The most significant relationship proved to be between foreign involvement and the resulting product and process structure which gave a result of 0.86 (significant at 0.01%) for diversification and 0.87 (significant at 0.01%) for vertical integration.

Rank coefficients for the level of foreign investment and the level of productive capacity and the height of entry barriers also proved to be significant at the 1% level, the results being 0.75 and 0.74 respectively.

Finally, the E.I. has experienced increasing concentration of net asset worth during the past 25 years, and a coefficient of D.F.I. and the level of 5-firm concentration ratios supported the previous findings for all U.K. manufacturing. A significant relationship between the two was demonstrated (1963; significant at the 5% level, and 1968; significant at the 1% level). This would further suggest that the relationship is tightening.

One final dynamic relationship was discovered. The Department of Trade was asked to supply figures on the growth of D.F.I. subdivided by minimum-list-headings. They were prepared to supply a ranking of such growth rather than the exact figures, and this was compared with the growth of productive capacity in the same areas. A rank correlation coefficient of 0.83 (significant at 0.01%) resulted from the analysis which demonstrates a significant relationship between the direction of investment and the growth of the indus-

try's minimum-list-headings.

It would appear valid, therefore, to assume that foreign affiliates are attracted to areas of the E.I. in a pattern which varies from the distribution of U.K. companies. The level of interest seems most significant in those areas which hold the greatest contribution to the changing structure of the industry. However, this is simply an open ended relationship, the question of causality can only be answered by a micro level approach relating to the operations of individual subsidiaries in their head-to-head competition with British owned companies.

It can merely be asserted at this stage that evidence seems to suggest that some relationship between industrial structure and foreign activity at an industry level does appear to exist, and several conclusions can be drawn as to what such a relationship means to the industry.

4.3. Conclusion.

The E.I. attracts the largest share of D.F.I. in relation to the percentage of U.K. production which it commands. This share has grown faster than any other industry.

The distribution of D.F.I. throughout the U.K. economy suggests that foreign investors are attracted to industries which are experiencing the fastest expansion and displaying the best possibility of high future returns which will enable the industry to maintain an above average level of growth.

The involvement of foreign investors in the E.I. is also related to the development of the industry, the increasing

numbers of foreign affiliates closely paralleling the development and success of the E.I..

The method of entry of foreign firms into the E.I. is also important. Whereas the green field venture has long been the most popular method, the trend is towards the increased use of the takeover, particularly amongst those parents with affiliates already present. Initial entry by the creation of a new establishment, and the use of takeover for expansion into new fields, is the most structurally disruptive method of entry and expansion, and these seem to be favoured by foreign participants.

As foreign investors are attracted to the E.I. over and above the industrial average, this means that the overall pressure for change at an economy level will be accelerated as compared with other industries. Also, as these foreign owned companies outperform indigenous industry equally across all sectors of the U.K. economy, and Bain (1951) and Quallis (1971/2), amongst others, have already shown that increased concentration and higher entry barriers can be beneficial to industry performance, the greater presence of foreign affiliates could also be beneficial to industry performance if it can be proved that their presence is related to the changing structural characteristics of the industry. Indeed, it has already been demonstrated that the distribution of D.F.I. within the minimum-list-headings of the E.I. seems related to the structural characteristics displayed therein. This distribution contributes an industry level effect upon the structure of the E.I., and there is also evidence to suggest that such effects vary with the geographical source of ownership.

The better performance of foreign affiliates can be accounted for by their access to technical and managerial expertise from the parent company, greater efficiency within the host country operations, better use of internalised markets, access to financial markets, or simply greater awareness of the more profitable sectors of the U.K. economy and the E.I. in particular. Evidence suggests that foreign investors do not necessarily only locate in the most profitable sectors of the U.K. economy, but in fact outperform indigenous industry across all sectors. Evidence further suggests that exploitation of internal markets for capital, technology, managerial skill and transfer pricing do not fully explain the advantages of foreign subsidiaries, and that greater efficiency and productivity by such firms seems to be in evidence.

D.F.I. does not find its way into the minimum-list-headings of the E.I. in equal proportions, nor does its distribution reflect the overall pattern of activity by British firms. The D.F.I. is also not homogeneous in its location, and different sources of investment are reflected in differing investment patterns. Foreign investors are attracted to areas with greatest potential development, rather than current profitability. These firms are also concerned to control the affiliate as tightly as possible, and dominant market shares are often carved out by combinations of such affiliates. Foreign participation seems attracted to areas of high concentration, often attended by greater degrees of foreign dominance.

Higher levels of D.F.I. are also witnessed in those sectors displaying the highest levels of entry barriers, fastest

growth of productive capacity, highest levels of vertical integration and specialisation. Admittedly this is so far only a circumstantial relationship, and the presence of D.F.I. on its own is not sufficient evidence to prove causality, however, it does suggest that such an impact may exist, and the firm level approach of the next two chapters will present such evidence as is necessary.

It is evident the D.F.I. does not find its way into the minimum-list-headings of the E.I. in equal proportions and if it is assumed for the moment that a relationship exists between D.F.I. and the structural characteristics of the headings, then a circular, self-generating argument becomes evident. If foreign affiliates are attracted in this manner then their very presence must lead to structural imbalance between the sectors of the industry dependent upon the level of foreign participation with some areas displaying better performance and faster growth than others. It must be assumed that such activity is to the benefit of the initiating organisation, and therefore, further foreign affiliates will be attracted to these sectors until the optimum level is reached and entry barriers become a sufficient deterrent. The new arrivals contribute to the structural modifications in their turn, and so the circle continues.

There is certainly evidence to suggest that this is the case and also that as the investment pattern of differing sources of D.F.I. is significantly dissimilar, the affiliates involved do not necessarily exhibit the same pressure for structural change.

Finally, the industry attracts two distinct types of

foreign entrant in greater than average proportions. The large scale affiliate of the larger M.N.C.'s, and the smaller more specialised company, usually R&D based. Again this fits in with the recent development of the E.I.'s structure.

Combining such findings with those of earlier writers it becomes evident that foreign investors are attracted in above average proportions to the industries of greatest growth, and those based on high levels of technological and managerial skill and expertise backed by large amounts of capital expenditure upon production and R&D facilities. As these are the areas responsible for the greatest pressures upon existing industrial structure, there is every reason to believe that D.F.I. has an important role to play.

However, in the study thus far a chartist approach has been adopted. Noted changes in the structure brought about by the development of the E.I. have been listed, and the, possibly circumstancial, presence of D.F.I. has been highlighted. In this way a large amount of economy and industry level evidence for a causal relationship has been suggested. However, this is not sufficient in that causality has not been conclusively proven. Hence the micro level approach of the next two chapters.

4.4. Summary.

4.4.1. During the period 1965-71 the E.I. experienced a faster growth in the percentage of net asset worth controlled by foreign participants than any other industrial sector. By the end of the period the E.I. was second only to Mechanical Engineering of the major industries, in the total percentage of net asset worth attributable to foreign investors.

4.4.2. This was not a continuous trend, peaking in 1967 and 1971, but falling slightly since that date.

4.4.3. The U.S. is by far the largest investor in the E.I. with 68% of the D.F.I. in 1973. The E.E.C. owned subsidiaries contributed a further 25.6% and the E.F.T.A. countries 5.6%.

4.4.4. The U.S. owned companies are attracted to investment in the E.I. over and above any other sector, and this is an increasing preference. The E.E.C. also displays this same attraction with nearly one third of all D.F.I. originating from these countries flowing into the E.I.. However, this is a declining trend.

4.4.5. The block of non-U.S. and E.E.C. based parents shows the highest rate of return, followed by the U.S. affiliates, and finally the E.E.C. firms, suggesting a relationship between profitability and origin.

4.4.6. The pattern of overall investment is distributed throughout the minimum-list-headings of the E.I. differs from that of the British companies, but the

pattern is not changing significantly.

4.4.7. D.F.I. is attracted to the areas of growth and greatest potential.

4.4.8. D.F.I. is particularly attracted to Electronics and Electronic Instruments.

4.4.9. Foreign owned firms operating in the U.K. are in general, more profitable than British owned firms.

4.4.10. The age profile of the investment in the E.I. is not important in determining performance.

4.4.11. The size of the investment tends to be either in large scale companies (net assets of greater than £5m.) or in smaller more specialised firms (less than £1m.).

4.4.12. The entry and expansion of foreign participants is generally by the methods most likely to cause structural upheaval.

4.4.13. A small number of parents (17%) control a large percentage of total sales by foreign participants in the E.I. (78.8%).

4.4.14. Foreign parents tend to control their affiliates more tightly, wholly and expertly than U.K. companies.

4.4.15. Foreign affiliates are to be found most readily in areas of the highest concentration.

4.4.16. The presence of D.F.I. is significantly related to those minimum-list-headings of the E.I. which have displayed structural characteristics most closely resembling the overall picture presented in Chapter 3.

4.4.17. The differential distribution of D.F.I. throughout the U.K. economy, its uneven spread throughout the

E.I. and the differing characteristics of the sources of investment would suggest that pressures for structural modification of the E.I. exist at an economy and industry level, and have been encouraged by the presence of D.F.I..

CHAPTER 5.

THE PRIMARY BEHAVIOURAL IMPACT OF DIRECT FOREIGN INVESTMENT.

The previous chapter was mainly concerned with monitoring the effects of D.F.I. upon the industrial structure of the E.I. originating from pressures for change at Economy and Industry levels, i.e. the destination effect of D.F.I.. In the next two chapters, interest lies in the behavioural impact of D.F.I., Chapter 5 dealing with noted changes in the primary variables, and Chapter 6 with the secondary variables. These could be classified as the immediate structural effect due to the presence of foreign affiliates, (primary variables) and the delayed effects which work through the primary variables; namely, productive capacity, the distribution of market power, the profile of the process and product structure, and the height of entry barriers. These secondary factors such as the operating efficiency, productivity, geographical location of foreign affiliates and the domestic reaction of host governments and indigenous firms, will also affect the industrial structure. The traditional marginal/cumulative division is not the basis for the separation of these effects, as it is our belief that all such changes are merely part of a continually dynamic situation. The subdivision is based upon the immediacy of the reaction of industrial structure to the pressures for change. Therefore the characteristics of the companies noted in this chapter will have an immediate impact upon the industrial structure of the E.I.. Those presented in Chapter 6 may give rise to further modification, but this will only work through the primary variables.

Whilst the total picture is obviously important, it would appear that this behavioural effect provides not only the most fruitful material for such a study, and possibly one of the most sensitive areas of public policy, but also contains a subject matter where the pressure for structural change has seldom been adequately documented on an empirical basis. It is clear that it is the operating results of the individual company and its competitive reaction to other companies' activities that cause any structural changes to occur, at whatever level the results are finally noted.

Taking each of the four variables of our structural definition, an attempt is made to explain the changes witnessed in Chapter 3, in terms of the involvement of British owned, and foreign owned companies in the E.I.. Where possible the findings of earlier writers will be introduced in order that direct comparison is available between the results of several studies, and any discrepancies (both theoretical and empirical), can hopefully be explained.

5.1. Data and Methodology.

There are three major problems of methodology. Two general ones, and a third peculiar to the analysis of D.F.I..

(1) Methodology must be constrained by data deficiencies. Lack of data, a major problem in this kind of study, causes the utilisation of second-best information, and a truncated methodology. Hence a wide use of proxy variables is often required to see any picture at all. As much information originates from respondents with a deep personal involvement in the noted

efficiency of their companies, and the legal and accounting requirements for the provision of such data by affiliated companies are minimal, only goodwill on behalf of the firm, and a good deal of backup effort on behalf of the researcher, enabled results to be presented in numbers which could be considered statistically valid.

(2) The analyst is faced with the problem of isolating the effects of D.F.I. from other changes occuring in the economy. The identification of causality is a constant problem in economic analysis. An a priori approach can suggest the possible direction of causality, but then the skills of the applied economist must take over. Thus methodology must steer a course between partial equilibrium analysis, where a much too static approach may be incorporated, and general equilibrium analysis where all but the most trivial aspects of a problem may be nullified.

(3) The problem peculiar to (and perhaps most acute in) the analysis of D.F.I. is the 'alternative position' assumption. This assumption is addressed to the question of the state of the economy (or in our case, industrial structure) if the particular foreign investment had not taken place. Any analysis is sensitive, therefore, to the choice of the alternative position. General theory can be of little use here. An analysis of the indigenous sector is an essential prerequisite to an appropriate answer (see Chapters 2 and 3).

This study, in general, makes the assumption that the British owned sector could not fully replace the activities of foreign affiliates should they have remained absent from the industry, and that D.F.I. has represented to some degree,

a net addition to British resources.

To some extent the alternative position assumption is not as crucial to this type of study, as one which attempts to determine the overall impact of D.F.I. on an economy. This is because the question of an alternative position is often included in the methodology by directly comparing the contributions of several different types of British and foreign companies on industrial structure, and we are therefore, often in a position to explain the exact differences between the different types of operation, and estimate what might have happened in the absence of any one group of companies.

If, for example, productive capacity increases in the E.I., and it is discovered that foreign affiliates are growing more rapidly than U.K. companies, with greater efficiency, and if it can also be seen that the British company is, and always has been, less efficient, then it is unlikely that they would in any event fully replace the gap left by a withdrawal of D.F.I..

To determine the effects of individual foreign and British owned companies, the evidence presented was collected by means of a questionnaire survey* (postal, backed by published information and personal approach where necessary), of 500 companies (approximately 10% of all enterprises classified to the E.I.), subdivided by ownership, size, and industrial activity (major product line.).

The foreign sector was split into three groups; namely, affiliates of U.S. parents, affiliates of E.E.C. country parents, affiliates of Other countries' parents. The sample was

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*See Appendix C for a sample questionnaire.

roughly weighted to represent the percentage of each group in the overall population, and to represent their distribution throughout the minimum-list-headings of the E.I.. Once total returns had been received, enough replies were available in each sector to re-weight the sample more accurately. This was of course necessary because not all areas gave an equal response.

The British owned group was also split into three sections, this time by ownership characteristic; affiliates of British companies with multinational operations, affiliates of smaller companies with only domestic affiliates, and independent firms with no chain of affiliated enterprises.* Again the original sample was constructed, so as to represent the market dominance of the first group, and their range of activities. On aggregating the returns, allowance was made for the disparities in the response of the three groups.

The reason for this six-fold sub-division was to try and eliminate two assumptions generally made by previous studies. Firstly, that all affiliates of M.N.C.'s have a similar impact on the host country, irrespective of nationality. This was thought to be an erroneous assumption, and not permissable on a priori grounds and therefore in need of empirical testing. The second major fault appeared to be the lack of a breakdown of the British group of firms into their differing ownership patterns and size. It seems reasonable to assume that the competitive reaction of the

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* A recent study by Sciberras (1977) has demonstrated the advantages of such an approach, with a more limited breakdown of company size.

affiliates of British owned M.N.C.'s will be very different indeed from those of smaller companies in the field. The differing reactions will affect the eventual weight of the pressure for structural change initiated by the entry of foreign firms into the E.I..

This sub-division enables comparison of the three foreign groups with various sizes of domestic firm, operating in different environments, and highlights which variations in performance are merely compatible with British owned affiliates of M.N.C.'s, thereby exhibiting their multinationality rather than their foreignness.* This has important implications for governmental policy, as action taken against the former could instigate reciprocal action against a country with M.N.C.'s of its own, whereas the latter implies that the differing business ethics of countries are being exported to the host country. Any disparities in the action of the groups therefore, could colour a host country's attitude to varying sources of investment.

The division of the indigenous sector also enables us to see which areas of the British sector are most affected by, the presence of foreign participants in an operating capacity.

Companies were classified according to a cross reference technique involving the S.I.C., Compass, and Dunn and

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* Every effort was made to ensure that the groups comprised a similar balance of firms in similar stages of the process structure, to enable accurate comparison of product width and vertical integration. However, the results are only as representative as the data restrictions allow.

Bradstreet indices, and finally checked against the industry's own index of companies. The establishments involved are parents, or affiliates which have a recognisable contribution to the production function, based in the U.K. and operating significantly within a heading of the E.I.. This stipulation of the inclusion of only operating establishments was necessary to eliminate any double counting involved in the figures supplied by the larger companies contacted.

Finally, 150 U.S. affiliates were contacted, 50 E.E.C., 50 Other, 200 affiliates of large British corporations, 100 small British companies, and 50 small independent British firms.

The response to the questionnaire was highly favourable (possibly due to the large degree of backup contact, and the length of time respondents were allowed in total to complete the form), and a 55.8% usable response recorded. (In some areas not all questions were answered or comments made, but as question responses were aggregated upon a horizontal rather than a vertical basis, this was not a major difficulty.) Those who failed to complete the form often wrote to say why they had not done so, and provided a useful insight into the rationale behind their operations.

Data, where possible, was supplemented by information from the Extel service, industry bibliographies, and company accounts. Higher management was invited to comment upon various questions within the subject area, and where available their ideas are introduced into the text. The results are presented in this and the following chapter, and compared where possible, to the findings of earlier

writers.

5.2. Productive Capacity.

Chapter 3 observed that the level of productive capacity of the E.I., as determined by several criteria, had risen disproportionately faster than the general expansion of the rest of the U.K.'s industrial sectors. There is no doubt that the E.I. contains some of the fastest developing companies in the U.K. scene. The question now to be answered concerns the possible role of foreign affiliates in this trend.

Previous studies (Stubenitsky, 1970; Rosenbluth, 1970; Deane, 1971; the Grey report, 1972; Dunning, 1973a and 1973b; Steuer, 1973; Horst, 1973.), assert that empirical findings suggest that foreign affiliates, in most parts of the world, including the U.K., are on average considerably larger than their indigenous competitors.

Several suggestions have been put forward as to why this may be the case. Caves (1974) proposed that a major explanation might be their access to scale economies because of their wider global operations, and the lesser likelihood of such affiliates being smaller than the optimum firm size for any particular industry. Knickerbocker (1973) would lead us to believe that the movement of foreign affiliates into the host country is based upon the oligopolistic reaction, and this would generally lead to greater concentration in the host industry and a trend towards larger company size.

This theory is closely related to work by Kindleberger (1969) who suggests that the oligopolistic follow-my-leader tactics of multinational parents leads to an excessive number of plants in operation, and a loss of maximum efficiency. This is supported by the results of a study by Safarian (1969) based on the Canadian economy, where 60% of the 165 foreign affiliates questioned reported their unit costs of production to be higher than those of their parent plant.

In this section the average company size is examined and supported by evidence of the growth of the number of establishments, turnover and employment within the six sub-groups of the survey. Table 5.1. presents the findings on average company size, and the results bear out the findings of the earlier writers:

The average company size of the companies under foreign ownership proved to be larger than their U.K. competitors. However, it is noticeable that affiliates of large British owned multinationals are comparable in size to those of the foreign affiliate. This suggests that the latter is displaying a characteristic of firms with multinational activities rather than one which is parent country specific.

The U.K. and foreign sectors are not homogeneous, and in the former the affiliates of smaller company groups and independently owned companies are significantly smaller in size than affiliates of larger parents. In the foreign group, the affiliates under E.E.C. member country ownership are, in general, far larger than those of the two remaining sectors.

As expected the sample provided a wider dispersion

TABLE 5.1.

Average Company Size by Ownership.	Sales £m.*	1975 (Total Respondents)
Large U.K.	22.7	(90)
Small U.K.	5.4	(39)
Independent U.K.	8.3	(38)
Total U.K.	15.8	(167)
U.S.	29.9	(68)
E.E.C.	40.1	(24)
Other	26.6	(20)
Total Foreign	26.5	(112)

*Operating Establishment.

Source: Author's own survey.

of company size around the mean in the British groups than in the foreign sector, with over 55% of the firms having an annual sales turnover of less than £10 million, and 20% contributing an annual figure of greater than £50 million. In the foreign group only 31% of the companies had annual sales of less than £10 million, and less than 10% sold goods to the value of £50 million or more. This demonstrates the tight grouping of the foreign affiliates around the mean size. The U.K. companies often had a few large affiliates and consequently this was balanced by large numbers of relatively small firms. This could well be based on the necessity of some minimum size requirement of new entrants in surmounting the differential entry barriers of the E.I.. Given the minimum size, however, the range of the plant size within the small and large groups in isolation, was wider than in the domestic sector.

This variation could exist, however, simply because the foreign affiliates are situated in sectors of the E.I. which require an above average operating size, and is not a general phenomenon. Table 5.2. shows the relationship between average company size, growth of company size, and the interest of foreign investors.

The findings demonstrate that foreign affiliates are not necessarily attracted to those areas displaying companies of above average size. Rank Spearman Correlation Coefficients on the distribution of D.F.I. throughout the minimum-list-headings, and average company size; and a second comparison of foreign penetration levels and company size, gave

TABLE 5.2.

Average Co. Size, Growth of Co. Size and Foreign Investment.

Minimum List Heading	Av.Co. Size (£)	Sales Rank	Growth of Co. Size*	Rank	D.F.I. Share** (a)	(b)
351	141,102	(12)	217.8	(5)	11	6
352	328,726	(9)	244.2	(4)	13	3
353	77,963	(13)	250.9	(3)	8	8
354	243,123	(10)	170.0	(8)	1	9=
361	386,203	(7)	123.5	(12)	3	13
362	1,862,918	(2)	263.8	(2)	10	5
363	1,837,000	(3)	185.8	(6)	9	7
364	377,718	(8)	178.5	(7)	2	4
365	775,940	(4)	164.9	(11)	12	9=
366	1,877,291	(1)	439.6	(1)	7	2
367	557,364	(6)	165.8	(10)	5	11=
368	670,570	(5)	170.0	(8)	6	1
369	149,089	(11)	115.1	(13)	4	11=

*$\frac{\text{Av. Co. Size 1972}}{\text{" " " 1963}} \times 100$

**
(a) Rank in share of total D.F.I.

(b) % of market controlled.

Sources: Department of Industry - Report on the Census of Production, 1968. H.M.S.O.

- Report on the Census of Production 1972, H.M.S.O.

results of-0.35 and 0.51 respectively, neither of which were significant. Indeed the first of these figures implies that whatever weak relationship might exist is of an inverse nature, i.e. foreign investors are attracted to areas of smaller than average firm size.

A second Rank Spearman Correlation Coefficient calculated on the relationship between the level of foreign penetration and the growth of company size gave a significant result of 0.71 (significant at the 1% level). This means that those areas of the E.I. within which the foreign affiliate holds a major (or sizeable) market share, also display the highest level of growth in company size. This suggests that whilst these affiliates are not necessarily present in those minimum-list-headings containing the largest companies, they are providing a significant influence in those areas displaying the most rapidly growing companies.

The above findings would suggest that the size distribution of foreign companies in the minimum-list-headings of the E.I. is unlikely to be purely randomised, in that a relationship exists between the level of foreign activity and industry characteristics, i.e. that there is a distinct pattern to the distribution of foreign affiliates.

These findings, that the average foreign affiliate is larger than the domestic counterpart, and is also expanding sales turnover at a greater rate, does not contravene the conditions of Gibrat's Law of Proportionate

Effect*. This states that there is no association between the initial size of a given company at the beginning of a stated time period, and the rate at which the company grows during that time period. This implies that other factors account for the disproportionate rates of growth experienced by differing firms. The above results simply provide evidence to suggest that the 'foreignness' and 'multinationality' of foreign affiliates can be presented as two possible examples of such other factors. Indeed, a chi-square test was carried out on the distribution of firm size of foreign affiliates in the E.I., and this proved to be not significantly related to a purely random distribution. This test was calculated under the strict

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* For a fuller discussion and testing of Gibrat's law see, for example - J. Samuels (1965), E. Mansfield (1962 and 1973), M. Marcus (1969), S. Hymer and P. Pashigian (1962), P. Hart and S. Prais (1956), J. Samuels and A. Chesher (1972), H. Simon and C. Bonini (1958), A. Singh and G. Whittington (1968), J. Eatwell (1971), amongst many writers who have produced material upon this subject. In particular the Mansfield (1973) article is a comprehensive review of the entry, exit and growth of firms under the conditions of the law.

conditions of Gibrat's law, hence suggesting that some logical pattern existed which could possibly be related to the structural characteristics of the minimum-list-headings of the E.I.. Here we use the equation -

$$Sij^{t+\Delta} = Uij\ (t,\Delta)\ Sij^{t}.$$

where:- Sij^{t} is the size of the jth. firm in the ith. industry at time t. $Sij^{t+\Delta}$ is its size at time $t+\Delta$, and Uij (t,Δ) is a random variable distributed evenly and independently of Sij^{t}.

The calculation is made on a X^2 principle. Firms are classified by their initial size Sij^{t}, and a frequency distribution computed of $Sij^{t+\Delta}/Sij^{t}$, which is done for a summation of all classes.*

The survey returns supported this, and indeed it was found that foreign affiliates are on average larger, in all the minimum-list-headings, than their indigenous competitors. This suggests that the drive for higher levels of production in any single establishment is higher in the foreign affiliate.

This means little, of course, to the growth of the E.I.'s productive capacity if there are simply fewer, larger foreign companies. It needs to be determined if the numbers of such establishments under foreign ownership are expanding at the same rate, or faster than the comparable indigenous company.

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*For a fuller explanation, see Edwin Mansfield, Entry, Exit and Growth of firms, in B.S. Yamey (ed.), The Economics of Industrial Structure, Penguin. 1973.

The evidence suggests that the number of foreign owned establishments is growing, whilst the overall number of establishments in the E.I. is falling. The E.E.C. based parents, and those of Holland in particular, are the major contributor to this growth, but naturally firms with parents of U.S. origin make the single most important impact because such affiliates are still consistently the major source of foreign expansion with almost 70% of the total foreign investment stake in the E.I.. Not only this, but the growth of sales turnover has been faster in the foreign affiliates, on average, than that of the British companies.

Finally the foreign establishments generally employ fewer numbers in like sized establishments, and pay higher wages. Even given these higher payments per employee, Table 5.3. shows that labour productivity, calculated simply, on output per £1 wage payment, is higher in the foreign affiliate than in British firms.

The E.E.C. affiliates show the greatest labour productivity, followed by the U.S. owned firms, and finally the remaining foreign owned firms. The affiliates of smaller British groupings have the lowest productivity, seeming to benefit neither from the economies of scale available to the larger British group, nor the intimate working conditions of the small independent manufacturer with their large percentage of highly motivated owner/directors, and often highly specialised processes. Such small firms often benefit from the low wage levels and yet good industrial relations associated with the 'family' business.

Thus it may be surmised that on all fronts, in all sectors,

TABLE 5.3.

Labour Productivity of E.I. Companies: by Ownership : 1975.

	Av.Wage (£)	Index of labour Productivity.*	
Large U.K. Companies	£1857.6	0.70	Weighted Average U.K. 0.69
Small U.K. Companies	£1837.4	0.65	
Independent U.K. Companies	£2002.4**	0.68	
Av. British	£1863.5		
U.S. Affiliates	£2226.4	0.80	Weighted Average Foreign 0.81
E.E.C. Affiliates	£2106.0	0.85	
R. of W. Affiliates	£3170.0	0.76	
Av. Foreign	£2291.1		

* 1 - Wages/Output (sales)

** Probably high because of the owner/worker/director relationship.

Source: Author's own survey.

the individual foreign firm is, in general, making a significant contribution to the growth of productive capacity in the E.I..

One further piece of data supports this conclusion. After allowing for the weighting of the sample, a 2:1 ratio of companies moving out of the industry, or suffering bankruptcy, of British to foreign firm, was noted, suggesting that when the hard times arrive, or competition becomes fiercer, it is generally the British company which succumbs first. This suggests that there is either support from the parent available, or that such companies exhibit an innate efficiency. (See Chapter 6.) It is also noticeable that the number of companies ceasing production in the E.I. has increased in recent years, even though the overall picture has been one of success, meanwhile the level of D.F.I. penetration has steadily increased. Further evidence, derived from various sources, including company accounts, Extel cards, industrial classifications, and direct contact by the author shows a faster growth in net output and employment figures for the foreign affiliate. This would appear to be true of each of the minimum-list-headings of the E.I., and in face of such evidence several conclusions can be drawn.

The overall size of the E.I. is increasing more rapidly than any other industrial sector in the U.K. economy (see Chapter 3), and this is being accelerated by the presence of foreign affiliates in the industry. These affiliates are, in general, larger than their British counterparts; located in those sections of the industry displaying the greatest growth potential; are less likely to withdraw from competition

in times of economic hardship; show a greater labour productivity, and experience a higher rate of return than the indigenous company.

These conclusions will only be valid, however, if assumptions are made concerning the possible outcome of the absence of D.F.I. in the E.I.. Given the inherent disadvantages of operating production facilities abroad, one would imagine that if any U.K. company was capable of providing market servicing equal to that of the foreign infiltrator, it would have been done so more easily at the outset whilst the new entrant was still unused to the British industrial environment. The lack of such a threat to the new entrant suggests that its activities would not be easily replaced in its absence. Secondly, the evidence shows that once established, often with the backing of the enormous power and wealth of the parent organisation, the foreign affiliate will consistently outperform the indigenous firm. This does not lead us to believe that the British company could fully replace it should the foreign establishment disappear from the country.

Finally, the size of the industry is most seriously affected by the emergence of new companies, and the rationalisation of existing ones. As the green field venture has been proved to be the most popular vehicle of entry into U.K. industry, and takeover as the most popular method of expansion once established (Steuer 1973), the growth of the productive capacity of the E.I. through foreign affiliate penetration seems to be the most logical conclusion.

Evidence based on the growth of sales turnover of the larger foreign affiliates also suggests that these companies

are growing at a much faster rate than the comparable U.K. company (Dunning 1966, 1973a and 1973b). Even allowing for the narrower base from which their growth rate is calculated, the absolute ratio of growth is significantly high enough to suggest that foreign owned companies have had no small hand in the rapid development and expansion of the productive capacity of the E.I. during the past two decades.

5.3. Distribution of Market Power.

In general, markets populated by international firms are typically marked by product differentiation and a relatively small number of controlling oligopolists.

Both Caves (1974) and Knickerbocker (1973) have argued the theory of the international extension of oligopoly power as the underlying motivation of D.F.I.. To accept this, some link between a changing distribution of market power, and the presence of foreign affiliates must be expected. Whether these affiliates actively generate increased market power, or whether they sponsor a domestic reaction (or some combination of the two), the final result will be the same. Chapters 2 and 3 noted the increasing concentration of the E.I. across the board. In Chapter 4 a significant relationship between the areas of greatest concentration and those of highest foreign penetration was discovered. Here concern is with the exact nature of this relationship at the operating establishment (firm) level.

Evidence from a study by Utton (1971/2) suggests that there are two underlying reasons for increasing concentration, namely, internal growth and merger activity. The conclusion to

the study was that the main responsibility for the increasing concentration of the E.I. up to 1965 was evenly shared between the two methods. Since this date further information supplied by the Department of Trade and Industry (1970), (supplemented and updated by reports from the Monopolies Commission and The Times 1000) shows that the E.I. is still one of the most merger active sectors of the U.K. economy. One would imagine that this has led to an increasing importance of the merger as the cause of the changing distribution of market power.

Although some writers have suggested that this relationship is not the case (e.g. Evely and Little 1960, Globerman 1979), most later writers suggest that some relationship does exist and that merger activity is an important element in this aspect of structural change.

Thus such conclusions have been drawn by several authors including George (1967), Shepherd (1964), Armstrong and Siblerston (1965), Scherer (1970), Samuels (1965), Bain (1970), and Sawyer (1971).

In this section three measures of the distribution of market power are used in an attempt to examine the role of the differing sources of D.F.I. and that of British companies in the changing structure.

Firstly, the ratio of the size distribution (see Section 3.2.2. for a definition), secondly the level of sales concentration*, and finally the merger activity of the various sectors are monitored as a measure of their importance to the overall noted changes.

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* The aggregate data did not exist for Section 3.2.2., but is available at company level from our survey.

In Chapter 3 three yardsticks were used to measure the changing distribution of market power within the E.I. as a whole. There it was discovered that the trend is for an increasing dominance of the large firm in the majority of the minimum-list-headings, and the increasing concentration of the net asset worth of the E.I. in the hands of the very few largest companies. The gap between the largest and smallest firms has been growing, with the medium sized companies feeling the squeeze of this polarisation. This increasing market dominance of the largest firms has been accelerated by the high level of merger activity in the industry, with by far the highest percentage being between firms already substantially involved in the specialisms of the E.I..

In the previous section reference was made to the above average size of the foreign affiliate, and the faster rate of growth that they maintain. This would suggest that a pressure for change in the distribution of market power either as the bigger companies grow larger, amalgamate and increase the concentration ratio still further, or by increasing the level of competition through the creation of more competitively sized companies amongst the medium sized group.

Previous evidence (Dunning, 1973a; Steuer 1973; Globerman 1979) suggests that only a slight relationship exists between foreign investment and changing concentration. This could be true without contradicting our findings. Even though, on average British firms are smaller than the foreign affiliate, the largest few companies in the E.I. are the parents of multinational operations themselves, and thus the effect of the growing size of the foreign affiliate will have little effect on the overall

concentration ratio, but the oligopolistic nature of the industry will simply be reinforced. To relieve some of this paradox, 10 firm concentration ratios have been used as the main source of data, to allow for the domination of the industry by domestically owned British multinationals. This is one of the major drawbacks of the concentration ratio as a measure of market power distribution, namely that it ignores the total spread of market power and assumes that the industry which has 50% of market sales in the hands of the top ten companies is automatically more concentrated than an industry which displays a comparable ratio of say 40%. Nothing is said about the fact that in the latter the remaining 60% of sales may be in the hands of a further 50 firms, and in the former the remaining 50% of sales may be distributed throughout several thousand. To try and avoid this inaccuracy, a ratio of size distribution, as defined in Chapter 3, was computed.

To measure the concentration ratios of the individual sectors of the E.I. and compare this with the distribution of foreign interest shows more clearly the attraction of such investors to areas of higher sales concentration. This poses the question of long, rather than short term development, and it might not be many years before the largest British companies feel the competition of the foreign infiltrators even more strongly. Already such companies as I.B.M., Philips, S.T.C., Kodak, Champion Sparking Plugs, and Hoover, amongst others, have made their mark either by internal growth or aggressive acquisition, and others are close behind.

The survey material, supplemented by data from company accounts, extel cards, and other industrial classifications,

returned evidence in support of these contentions.

Firstly, Table 5.4. presents the results of a calculation of the ratio of size distribution. The figures show that the largest foreign owned companies are considerably larger than their smaller collegues, and this polarisation of sizes is an indication of a high concentration of market power in the industry's larger foreign affiliates. The foreign sector as a whole contains large firms which control higher proportions of the labour input of their sector than is true of the British owned firms. Not only are these companies absolutely larger, but the spread of the ratio is much greater, signifying greater concentration of control over labour input in the foreign sector than in the British, in the hands of the biggest companies. The U.S. and Other groups of companies show the greatest concentration, closely followed by the E.E.C. originating affiliates, and even the affiliates of the larger British multinationals lag behind the foreign affiliates, other than the E.E.C. group, in the degree of concentration they display.

As the host country firms are expected to display a wider range of company sizes than the foreign sector, it might be expected that the reverse situation would be true. In fact adding together the results for the top two size clusters in an attempt to eliminate any bias introduced because of a few, possibly very large, foreign affiliates, the dominance of the large firms in the foreign sector becomes even more evident.

Turning to the concentration ratio, the same results appear. Heavier sales concentration is evident throughout

TABLE 5.4.

Size Distribution of Affiliates : by Ownership - 1975.

No. of Employees	Large U.K.			Small U.K.			Independent U.K.		
	%Est.*	%Emp.**	Ratio***	%Est.	%Emp.	Ratio	%Est.	%Emp.	Ratio
<500	25.4	0.6	0.02	50.0	9.0	0.18	43.5	10.3	0.24
500-1000	18.6	1.3	0.07	22.7	17.5	0.77	21.7	16.5	0.76
1000-5000	23.7	4.9	0.21	28.3	73.5	2.60	31.8	38.7	1.22
5000-10000	6.8	4.7	0.70	-			N/A	N/A	N/A
10000-20000	15.2	18.5	1.22	-			4.5	34.4	7.64
>20000	10.2	70.1	6.87	-			-	-	-

No. of Employees	U.S.			E.E.C.			Other.		
	%Est.	%Emp.	Ratio	%Est.	%Emp.	Ratio	%Est.	%Emp.	Ratio
<500	24.9	1.4	0.06	60.3	3.2	0.05	54.5	3.2	0.05
500-1000	23.6	5.3	0.23	N/A	N/A	N/A	9.1	2.3	0.25
1000-5000	35.9	30.1	0.84	20.1	15.6	0.78	18.2	21.1	1.16
5000-10000	6.4	20.0	3.13	N/A	N/A	N/A	8.2	72.0	8.78
10000-20000	6.4	35.0	5.47	13.4	42.4	3.16	-	-	
>20000	1.1	9.3	8.45	6.7	39.8	5.94	-	-	

* Percentage of Establishments accounted for by each size grouping

** " " Employees " " " " " "

*** %Employment accounted for by each group / %Establishments " " " " "

Source: Author's own survey.

the foreign sector, and is especially noticeable in the E.E.C. and Other groups, even allowing for some exaggeration by the smaller number of firms involved in the latter.

From Table 5.5. it is noticeable that as the larger concentration ratios are computed, the British sectors begin to close the gap, implying that whereas several large firms are operating in the British sectors, the concentration of production is in the hands of a few large groupings of affiliates in the foreign sector. This also implies, in connection with the findings of the previous section, that this above average firm size of the foreign companies is concentrated into the hands of large, powerful groups, rather than spread evenly over all the affiliates. The individual companies within these groupings are fairly evenly spread in size and consistent in their contribution, thus accounting for the earlier results which suggested the overall range of company size was less in the foreign sector than the British. Examination of returns on the individual minimum-list-headings of the E.I. show the production of the affiliates to be concentrated in the hands of a few large companies. This is not the case in the British sectors. This is true for the majority of the specialisms of the E.I. demonstrating the increased pressure for greater degrees of concentration caused by the presence of foreign affiliates.

Both the above measures suggest that the presence of foreign affiliates in the E.I. is adding to the increasing level of concentration of labour input and sales output into the hands of the largest companies, and therefore the increasing market dominance of the E.I.'s biggest companies. The distri-

TABLE 5.5.

Sales Concentration of Subsidiary Group Activity : by Ownership 1975

	3 Firm	5Firm	7 Firm	10 Firm
Large U.K.	37.5	53.0	65.3	75.4
Small U.K.	25.3	33.4	45.3	50.2
Independent U.K.	30.0	38.8	45.2	56.8
U.S.	41.0	55.9	68.5	81.0
E.E.C.	65.0	74.6	89.1	93.4
Other	75.5	80.9	90.5	96.1

Source: Author's own Calculations.

bution of market power is decidedly changing with increasing imperfection in the market structure. Whereas in the bulk of U.K. industry the foreign affiliate has injected greater competition into the market, several areas within the E.I. have not found this to be the case. To the extent that the Monopolies Commission have been involved in some instances. Champion Sparking Plugs, Kodak and I.B.M. are just three examples of overseas companies establishing and maintaining an early position of market domination.

The third measure of the role of foreign affiliates in the redistribution of market power, consists of regarding the position of such affiliates in the high level of merger activity present in the E.I.. There is evidence to suggest an important contribution to the level of merger activity either directly involving foreign affiliates, or by initiating a domestic reaction. Whilst it still proves impossible to construct a comprehensive list of such acquisitions owing to the lack of coverage by official sources or corporate directories, large individual movements can be highlighted.*

Perkin Elmer, Texas Instruments, Hewlett-Packard, Dynamco, Instron, and Varian Associates all entered the Electronic testing and measuring equipment field between 1952 and 1963. By 1970 these companies controlled over 30% of the market, Schlumberger and Philips possibly controlling a further 12-15%. In the field of television set manufacturing and sale, the Philips-Pye group controlled 25% of the market by 1970. Foreign

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* Contacts with the Department of Industry revealed that the major source of information for the section compiling such data was a daily scan of the press.

companies grew in power in Telephone and Telegraphic equipment, especially Ericsson, S.T.C. and Pye, all appearing in the industry's five largest companies by 1968. S.T.C. and Ferranti are listed in the five largest line equipment manufacturers, whilst Hoover and Philips alone control nearly 50% of the domestic washing machine industry.

The list is long, with I.B.M. and many smaller firms in computers; Pirelli, S.T.C. and Enfield Cables in Insulated Wires and Cables; Philips, Ronson, Parkinson Cowan, and Singer dominating the foreign effort in the domestic electrical goods heading; Kodak, Addressograph-Multigraph and National Cash Register Company in the various fields of Photographic and Industrial Instruments. Still this list only scratches the surface. Groups such as Ozalid Holdings have continually purchased British companies as a means of expansion, and the same can be said of Pirelli General Cable Works, Babock and Wilcox, I.T.T., Philips, Freuhauf, A.C. Cossor, amongst others.

It would seem naive to believe that the large scale British domestic mergers of the 1960's and 1970's have not been influenced or even initiated by the presence of strong foreign competition, both in the U.K. and abroad. G.E.C./A.E.I.; B.I.C.C./ Pyrotenax; Thorn/Radio Rentals; Elliott Automation/English Electric; G.E.C./English Electric; and the construction of I.C.L. have all found either financial support from the now defunct I.R.C. (largely the main duties of which are now vested in the N.E.B.), the Ministry of Technology, or the approval of the Monopolies Commission.

Effective competition against I.T.T.'s British affiliate S.T.C., I.B.M. and Philips, amongst other foreign giants has been sponsored by the I.R.C. and the operation of this corporation in helping British companies to compete more effectively

against foreign companies, is probably most clearly seen in the E.I. from 1967 to the end of the decade. Its operations and those of the newly created National Enterprise Board are the clearest indication that the central authorities see the need for domestic rationalisation as a basis for international competition, much of which is right here in the U.K..

As the E.I. is the most merger active industry in combination of net asset value, but much smaller in terms of absolute numbers of companies involved, the average merger size is much bigger than that for other industries, which implies greater structural upheaval. The U.S. is the most concentrated economy in the world and as the majority of the foreign affiliates in the E.I. are of U.S. origin, it can be expected that the same transfer of oligopoly power will be registered in the U.K..

Therefore there seems evidence to suggest that the presence of D.F.I. is increasing market concentration in all areas of the E.I.. The weight of the presence is registered in the fact that 22 of Britain's largest companies with major holdings in the E.I. are affiliated or associated with foreign parents. (16 of these being of North American origin). (See Table 5.6.)

5.4. Product and Process Structure.

The effect of D.F.I. upon the product and process structure of any industry will vary, inter alia, according to the strategy of the investing firms and the role of the affiliate within this global strategy. If the parent organisation is a highly diversified conglomerate, producing a wider range of products than the average indigenous firm, and this ability is transmitted to the affiliate, then product differentiation

TABLE 5.6.

The 50 Largest Companies with Major Interests in the E.I. (1978).

1. G.E.C. (U.K.)
2. B.I.C.C. (U.K.)
3. Hawker Siddeley (U.K.)
4. Thorn (U.K.)
5. Lucas (U.K.)
6. Philips (Dutch)
7. E.M.I. (U.K.)
8. Plessey (U.K.)
9. Rank Xerox (U.K.)
10. I.B.M. (U.S.)
11. I.C.L. (U.K.)
12. S.T.C. (U.S.)
13. Babcock & Wilcox (U.S.)
14. Alcan Aluminium (Can)
15. Clarke Chapman (U.S.)
16. Reyrolle Parsons (U.K.)
17. Kodak (U.S.)
18. Smithes Industries (U.K.)
19. Nat. Cash Reg. Co. (U.S.)
20. Gerstart (U.S.)
21. Drake & Cubit (U.K.)
22. Lamson Industries (Can)
23. Decca (U.K.)
24. Ferranti (U.K.)
25. Smith & Nephew (U.K.)
26. Automatic Rent's. (U.K.)
27. Ever Ready (U.K.)
28. Burroughs (U.K.)
29. Honeywell (U.S.)
30. Currys (U.K.)
31. Pirelli (IT.)
32. George Kent (U.K.)
33. Westinghouse (U.S.)
34. Parkinson Cowan (U.S.)
35. James Scott (U.K.)
36. Aberdare Hold's (U.K.)
37. Elec. Rentals & Gen. Hold (Dutch)
38. Ward & Goldstone (U.K.)
39. Alderson Major (U.K.)
40. Elec. Components (Fr.)
41. Br.Radio & Wireless (U.K.)
42. W.Corning & Co. (U.K.)
43. Singer (U.S.)
44. Lawrence Scott (U.K.)
45. Bowthorpe Holds. (Fr.)
46. Addressograph-Multigraph (U.S.)
47. Ronson (U.S.)
48. General Elec. (U.S.)
49. Ofrex (Fr.)
50. Louis Newmark (U.K.)

Source: Times 1000; (1977/8) based on Dun and Bradstreet, S.I.C. and Kompass, classifications.

may increase. Conversely, if product rationalisation follows a takeover, the reverse may be true.

Again much depends on the original motive for the initial investment, and the ease with which products currently imported can be bought from other plants of the enterprise. However, because the parent company is domiciled abroad, one would expect affiliates to be rather more truncated in their operations than in the case of independent firms. Certain types of industry entail a complicated process chain of component manufacture and assembly, with high levels of specialisation required of the individual affiliates. If this is the case, the presence of foreign affiliates would tend to reduce the level of product differentiation witnessed in the host industry.

Ceteris paribus, one would expect rather less product differentiation and diversification, and rather more product or process specialisation and integration in interdependent affiliates as opposed to independent affiliates. In the case of process specialisation it is possible that no country in which the M.N.C.'s operate might supply the complete product, e.g. I.B.M. Europe. Meanwhile, previous empirical studies (Safarian, 1966; Eastman and Stybolt, 1967; and Horst, 1972) in general support the contention that foreign affiliates are both concentrated in industries in which product differentiation is most marked, and increase the level of differentiation and promotional behaviour in host countries.

The foreign affiliate raises the question of whether or not it will behave differently from the indigenous firm, produce a different range of products, and engage in process

specialisation and some differing degree of vertical integration. This could arise through the branch plant effect and the international character of its operations. Top level administration, management, finance, R&D, etc., will tend to be provided from outside the host country. The advancement of the goals of the parent company may conflict with the product and process structure of the indigenous companies of the host industry.

In the E.I. there is a situation of an industry of two distinct and differing areas. The dominating area of electrical intermediary capital goods, and the electrical consumer commodity market. In the former the level of product differentiation is low, given the professional, high technology base of the bulk of the buying and selling transactions. Meanwhile the latter is based heavily on an assembly line activity with no one company providing more than a few steps in the process chain. (Although by vertical integration a group of firms under common ownership may control the complete process structure).

In Chapter 3 it was suggested that the industry was becoming more specialised in its companies' operations. The overall range of products is admittedly becoming wider, but the production structure is being broken down into smaller and smaller specialisms. This leads to a far greater interdependence between firms within corporate groupings, and accordingly the Index of Vertical Integration has risen significantly and consistently since the second world war.

Accordingly the 500 surveyed firms were tested on their own degree of corporate vertical integration, and the level

of product diversification.

Two questions were asked:-

"What percentage of your total purchases of raw materials originate from companies under the same ownership as yourself? (If you are a parent company, the percentage acquired from your affiliate (s). Please include the figures for semi-manufactures and capital goods and intra-company service input.)"

and:-

"What percentage of your sales turnover derives from transactions within.....?" (Where the major product line was stipulated on the questionnaire for each individual company.)

The results are presented in Tables 5.7. and 5.8..

Table 5.7. demonstrates the higher degree of vertical integration present in the groupings of foreign affiliates. On average foreign affiliates purchased over 26% of their raw materials on an intra-group basis, whilst the corresponding figure for all British companies was only 12.6%.

The most interdependent affiliates were those under E.E.C. based ownership, where on average just under 47% of all trading was of an internal nature.* The remaining foreign affiliates, other than the U.S. firms, bought about 28% of purchases from companies under the same ownership. In the foreign group, the U.S. firms displayed the greatest autonomy in this area,

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* Allowance must be made here for the overwhelming presence of Philips which could mean that the intra-firm trading policy of one firm is simply being represented as a trait of all E.E.C. companies. However the non-Philips companies still averaged over 35%.

TABLE 5.7.

Average Vertical Integration* amongst the Companies of the E.I., by Ownership.

Large U.K.	15.6%
Small U.K.	4.8%
Indep. U.K.	-
Total U.K.	12.6%
U.S.	17.0%
E.E.C.	46.6%
Other	27.9%
Total D.F.I.	26.1%

* Percentage of purchase of raw materials and services input originating from companies under the same corporate ownership.

Source : Author's own survey.

with only 17% on average, of raw material purchases and service inputs originating from fellow associates.

The larger corporate groupings under British ownership came closest to the U.S. figure, with 15.6% of purchases from fellow affiliates, but the returns for the smaller British group showed a figure of less than 5%. Of course these results may merely be picking up size differences in the companies. However, subdividing each of the foreign groups into returns for larger and smaller companies (greater than, and less than £10m. turnover, respectively), both groups displayed higher ratios than the British firms. (U.S., 16.9% and 17.7% respectively; E.E.C., 38.0% and 54.5%; Other, 25.4% and 33.0%). Which means that both groups of smaller and larger companies are significantly more highly integrated vertically in their process structure, than the domestic groups, including affiliates of large British multinationals.

Also in the foreign returns, the smaller companies are much more a part of the process structure's internalisation than their larger collegues, implying that greater autonomy and process control is available to the larger foreign affiliates. Table 5.8. shows the returns which enable the calculation of an index of diversification.

Foreign affiliates are more specialised and less diversified in the individual establishment than their British counterparts. Only the highly specialised nature of many of the operations of small British companies brings the average figures anywhere near the returns for the foreign groups. This could be expected, however, because the higher levels of vertical integration witnessed earlier in the foreign affiliates would suggest a more truncated operation in these comp-

TABLE 5.8.

Average Diversification* of Companies within the E.I..

Large U.K.	Small U.K.	Independent U.K.
Average - 0.480	Average - 0.278	Average - 0.432
Largest 10 - 0.743	0.350	0.640
Smallest 10 - 0.334	0.197	0.298

U.S.	E.E.C.	Other
Average - 0.329	Average - 0.395	Average - 0.362
Largest 10 - 0.360	0.471	0.410
Smallest 10 - 0.120	0.149	0.168

Average British - 0.410

Average Foreign - 0.338

* $D = 1 - \sum_{i=1}^{n} pi^2$ where the level of Diversification (D) is the proportion of firm's sales in the Industry devoted to the major product of the S.I.C. classification

and pi= $\frac{\text{Firms output in the major industry (i)}}{\text{Firms output in total. (n industries).}}$

Source: Author's own survey.

anies as part of an integrated process structure. The product range would, therefore, be expected to be more specialised and confined to a particular company group strategy.

Looking at the varying sizes of the firms within the E.I., subdivided by source of ownership, also presented in Table 5.8., greater specialisation is increasingly noticeable in the smaller companies. As the firms grow larger the increasing level of diversification is more noticeable amongst those of British ownership, than those affiliates under foreign ownership. Indeed, only the wide range of products produced by the Philips controlled Pye group, by increasing the overall diversification of the E.E.C. owned group, brings the D.F.I. figures anywhere near those of the British firms.

In conclusion, therefore, foreign affiliates are more interdependent rather than independent, with higher levels of vertical integration, leading to more specialised process operations and lower levels of individual operating company diversification, than is present amongst indigenous firms. This is in line with the trend noted in Chapter 3 for the industry as a whole, and once again the evidence supports the original hypothesis that the presence of D.F.I. in the E.I. is helping to mould its industrial structure, and often in a more significant manner than the indigenous sector given the smaller number of such affiliates than domestically owned firms.

5.5. Ability to Protect the Market.

Finally, an industry is only as strong as its protective barriers, and Chapter 3 demonstrated that entry to the E.I. was becoming more difficult.

Unit costs of production, as measured by R.&D. overheads have increased rapidly over the last two decades (see Section 3.2.4.). The average newcomer must be prepared to apportion larger amounts of capital to technological research and development. This would necessitate either a highly specialised facility and/or large scale production to enable the allocation of overheads to a wide range of profit centres.

The increased labour productivity of the bigger companies over and above that of the industry's smaller firms, was used as a measure of the existence of economies of scale within the E.I.. It was discovered that such economies were present, and that the overall productivity in the E.I. is growing and posing problems for the new entrant. Even the small firms work to high levels of efficiency. The technical and specialised expertise necessary to operate in this field, are probably the greatest barrier to the would-be entrant, and two facts bear this out. Firstly, that the vast bulk of merger activity is between companies wholly within the E.I., and secondly, the large amounts of foreign affiliates with parents already specialised within sectors of their own electrical and instrument engineering industry.

The presence of foreign affiliates in the E.I. has helped accelerate the trend for greater dominance of the larger firm, and thus reducing the level of competition in the industry. This increased level of concentration might be expected to lead to higher entry barriers facing the potential entrant.

In theory the final effect has two considerations. On the one hand, whether set up by green field venture or a take-over situation, the affiliate may help lessen market imperfections, e.g. by opening up new markets, sources of inputs,

access to patents and the like. On the other hand, some of the advantages of the foreign affiliate arise because it enters the market in a truncated form, capitalising on the economies of scale which stem from the centralisation of functions which would otherwise have to be undertaken by a de novo indigenous firm. This is likely to create new barriers for potential future entrants. Once established the economic power of the affiliate may also raise barriers to entry by making potential entrants more hesitant to compete (Weston, 1973).

The role of the foreign affiliate within its parent's global strategy may, therefore, aid or hinder the development of entry barriers. As Dunning (1973a) has said:-

> "Control of exports of an affiliate by the parent company may have the same effect as a barrier to market entry; control over the sourcing of inputs bought by affiliates may not always operate in the best interests of the affiliate; control over R&D activities may be a barrier of entry to innovation or to the development of local skills; control over trade prices may be a barrier to competition control over product or process strategy may inhibit a country developing an independent industry. All these practices are the stock in trade of M.E.'s whose affiliates are interdependent and geared to a common strategy on the part of the parent company."

Various devices may have little to do with affiliate efficiency, e.g. predatory pricing, non-price competition, subsidised costs, acceptance of loss makers, transfer pricing policy etc.. Most of these devices are practised by conglomerates in all fields, and in a variety of political and economic environments.

The internalisation of markets by M.N.C.'s can be another source of pressure for higher entry barriers, and once this has been achieved, then many of the above practices become

available and attractive to the organisation. If the corporation has evolved largely in response to the incentive to internalise, then it is possible that many of the characteristics of M.N.C.'s are attributable not to multinationality per se, but to the factors which govern internalisation. Buckley and Casson (1976) identify five major reasons why the market for knowledge has an incentive to internalise which is particularly strong.

Firstly, the production of knowledge through R&D and its implementation in new products or processes. This is a long term, risky decision, and in the absence of futures markets, effective planning requires internalisation of the market. Secondly, knowledge is a natural monopoly, at least for a limited period of time, and is best exploited through discriminatory pricing of some kind. Licensing systems often prove inadequate, therefore internalisation is again appropriate. Thirdly, the prospective purchasers of knowledge are in many cases monopsonists. Since the proprietor of the knowledge is effectively a monopolist, there is a bilateral concentration of market power. The bargaining conflict may require some form of joint ownership to resolve it. Fourthly, buyer uncertainty is almost inevitable whenever unpatentable or unregistered knowledge is being marketed. There is a strong incentive for the seller to assume the buyers risk by internalising the knowledge and integrating forward into the buyer's industry. Finally, because flows of knowledge are so difficult to value, they provide an excellent basis for transfer pricing.

General access to internal markets helps to increase the

level of entry barriers as suggested above, and the internalisation of R&D activities is a particularly good example. The internalisation of knowledge generated by R&D implies that production and marketing must be expanded continually at a rate sufficient to absorb entirely within the firm, the new products and techniques generated by R&D. Therefore, some experience of successful exploitation of economies of scale would increase the level of entry barriers. The acquisition of new production facilities in the E.I. by the aggressive foreign parent would be reflected in the level of merger activity by such companies, and so this will also be examined. Firstly, however, the level of R&D expenditure is measured as a proxy for the overhead costs of production faced by potential entrants as a barrier to entry.

Previous evidence suggests that even allowing for the availability of centralised resources, the foreign affiliate, on average, undertakes at least as much R&D (as a percentage of sales turnover) as their indigenous competitor. In the U.K. 180 of the 270 leading U.S. affiliates had their own R&D facilities by 1970. (U.S. Tariff Commission 1973.) Mansfield (1974) has also concluded that the M.N.C. has probably speeded up the international diffusion of new technology.

The supporting results of the present survey are presented below in Table 5.9..

This is always a difficult question to broach because of difficulties in the precise quantification of many of the components of R&D effort. Blanket payments, no payments at all, the generation of free generalised knowledge within large corporations and pricing problems all make the assessment of

TABLE 5.9.

R.& D. as a Percentage of Sales - by Ownership.

Large U.K.	3.15%
Small U.K.	1.82%
Indep. U.K.	4.00%
Total British	3.05%
U.S.	4.86%
E.E.C.	3.56%
Rest of the World	4.57%
Total Foreign	4.72%

Source: Author's own survey.

prices or shadow values difficult, and will vary with the efficiency of the research team. Also proprietary technology cannot have an established market value unless barriers to its transmission are artificially created.

Two conflicting criteria for pricing often are the cost of production, and the economic worth, the latter being very much a subjective decision. Obviously, therefore some of the returns will be based upon estimates and subjective appraisals. All the foreign affiliates contacted admitted some degree of dependence on the parent organisation for R&D effort, and transfer pricing policy means that the returns must be viewed in the light of such limitations.

The results show that foreign companies operating in the U.K., on average, spend more upon R&D in the U.K. as a percentage of their sales turnover, than their British counterparts. When one realises that some aid will also be forthcoming from abroad, the total R&D effort to which the affiliate has access will be greater than the figures suggest. Even so, on average, the foreign affiliate spends approximately 5% of their total sales revenue on R&D, whilst the corresponding figure for the average British firm is barely 3%.

The affiliates of U.S. origin show the highest percentage, followed by the non-E.E.C. originating companies, followed finally by those from the E.E.C.. The British figure was increased by the specialist R&D function of the small independent companies.

This aspect has further connotations, in that, R&D can be seen as an engine of growth in most modern companies. Denison (1962) in particular, refers to the importance of

growth due not to an increase in the quality of the physical factor inputs, but to an improvement in the knowledge content and techniques of production, (the residual factor in economic growth). Mansfield (1973) has also demonstrated that successful innovators grow at an above average rate.

In the modern world, producers of such new knowledge are rewarded by a temporary monopoly position. The producer is influenced by the size of the market available and also the incremental costs and risks involved. The bigger the organisation, therefore, the bigger the reward from economies of scale. Hence the dominant position of, for example, the U.S. with its large domestic market aided by government patronage, and hence able to muster a vast quantity of specialised resources. A priori we can expect, therefore, to see some evidence of the advantages of R&D effort demonstrated in the operations of such affiliates vis-a-vis their domestic competitors. Dunning (1970b) has called this 'proprietory' technology, when owned or controlled by particular institutions.

Such technology is transmitted almost entirely by D.F.I. or by licensing agreements. Non-propriety technology is easier to obtain through technical assistence, imitation, or the purchasing of goods, but tends to be less important because it will not be so closely linked to vital production or product innovations. The access of the affiliate to such knowledge, often at below arms length prices is an important factor in the success of affiliates of large M.N.C.'s. In theory the host country companies can benefit from a transmission of this technological expertise, however, in practice this has not always been as successful as the theory would lead

us to believe.

There are several barriers to the easy transmission between the two ownership groups. (i) The existence of Dualism, where 'Economic Dualism' may be defined as the continuing coexistence of a 'modern' sector and a 'traditional' sector within the domestic economy, (Myint 1970). Singer (1950 and 1970) has suggested that the transmission of knowledge between the foreign sector and the domestic economy is minimal unless the foreign affiliate is absorbed fully into the host economy. The extent of such absorbtion can be measured by the linkage effects created by the foreign sector. Where dualism is evident, the foreign entrant merely enhances the existence of dualism with few linkages existing between the over-resourced 'modern' sector, and the under-resourced, more inherently indigenous, 'traditional' sector.

However, the demonstration effect of new technology introduced by the foreign sector may help improve productivity throughout the host economy, and the entry of new firms may provide a salutary 'shock' to the domestic competition. (ii) Exporting and import substituting operations are not always directly comparable, (iii) Weaknesses exist in the domestic sector linkages in input/output due to the autonomy of the foreign sector, (iv) Small scale of firms or slow adoption of new ideas by the domestic firms.

Thus stimulation of domestic R&D through the effects of demonstration, competition, radiation and encouragement have been small, but to some extent better than other recipient countries given the high level of indigenous R&D effort vis-a-vis some other countries. However, the bulk of the techno-

logy is retained within the new entrant and this would suggest a heightening of the level of entry barriers.

Often, therefore, the encouragement and acceptance of D.F.I. will be the only means available of gaining access to new technology, and thus control of technology is one of the major aspects of multinational strategy. (Brooke and Remmers 1970).

It must be determined, however, if the foreign affiliate exploits economies of scale more readily than the average British company.* Table 5.3. demonstrated that foreign affiliates pay higher wages than British firms, and showed a higher labour productivity than their U.K. competitors. Table 5.10. presents the distribution of this productivity throughout the differing sizes of company in the industry, subdivided by ownership.

Whereas the foreign affiliates are nearly half as efficient again in the largest companies, the British are only just over 25% more efficient. It would seem that the foreign affiliate exploits economies of scale more effectively than the British firm, especially the U.S. firms, followed by the non-E.E.C. originating firms and finally the E.E.C.. So once again the level of entry barriers appears to be heightened by the operations of foreign affiliates in the E.I..

An important role of foreign affiliates within the rationalisation of any industry is their effect upon the level of merger activity, and their involvement in the number of

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* For a full discussion of the sources of economies of scale see:- Bain 1956; Robinson 1958; Pratten and Dean 1965; and Pratten 1971.

TABLE 5.10.

Economies of Scale* in the E.I. : by Ownership.

	Large U.K.	Small U.K.	Indep. U.K.
Largest 10%	0.83	0.63	0.81
Smallest 10%	0.62	0.52	0.69
Index	1.34	1.21	1.17

	U.S.	E.E.C.	Other
Largest 10%	0.88	0.84	0.81
Smallest 10%	0.60	0.65	0.61
Index	1.47	1.29	1.33

Average U.K.	1.28
Average Foreign	1.41

*Labour Productivity of largest 10%
Labour Productivity of smallest 10%

where labour productivity = 1 - Wages/Output.

Source: Author's own survey.

mergers taking place. Earlier sections demonstrated the impact that foreign affiliates are having on the level of merger activity, and this can be taken as yet a further sign of their effect on the level of entry barriers, as the newly enlarged firms will be in a position to exploit economies of scale, pursue high levels of R&D, and engage in oligopolistic practices which may lead to a contraction of competition and increased entry barriers by collusive practices leading to a cartel situation.

5.6. Conclusions.

Firstly, the rapid growth of the productive capacity of the E.I. has repeatedly outstripped the other industries of the U.K. economy. The average company size, and the level of labour productivity within these companies has also risen faster than in the remainder of the industrial sector. The foreign affiliates operating in the E.I. maintain, on average, larger establishments than their British counterparts, and exhibit a higher level of labour productivity despite the tendency to pay wage rates above the national average for E.I. companies. Meanwhile, whilst the overall number of establishments in the E.I. has begun to fall since 1970, the number of foreign owned establishments, the plants under their control, and the overall level of D.F.I., have continued to rise.

It can be concluded that a disproportionately high contribution to the increasing rate of growth of the E.I.'s size and importance within the U.K. economy, originates from the operations of foreign affiliates within it.

Secondly, the level of sales concentration is increasing in the E.I. with the distribution of market power shifting more into the hands of the industry's largest corporate combinations. The foreign sector again shows the largest degree of concentration of production, and has a greater range of the distribution of market power between larger and smaller companies, with the larger firms controlling higher percentages of the labour input than the bigger British owned firms, and the smaller companies having less control of the total labour supply than the smaller British owned firms. This is probably only to be expected owing to the widespread intervention of the foreign conglomerate into the U.K. industry, which evidence suggests, play a not unsubstantial role in the rationalisation of the most merger active industry of the U.K. economy. This evidence, in conjunction with the analysis of Chapter 4, suggests that the foreign affiliates of the E.I. help in no small way to accelerate the trend for an increasing level of concentration and imperfection of competition in the markets of the E.I..

Thirdly, the product and process structure of the E.I. has also witnessed changes over the past three decades. Greater establishment specialisation in a wider conglomerate product mix, with higher levels of vertical integration, have been evident in the operations of the companies comprising the industry. As expected the truncated nature of the foreign entrant's operations, tends towards a more interdependent process structure with higher levels of vertical integration. This was indeed found to be the case, with foreign affiliates displaying greater levels of interdependence and product

specialisation within the product and process structure. Once again evidence suggests that the foreign companies have contributed significantly to the changing industrial structure of the E.I..

Finally, greater exploitation of economies of scale, higher R&D expenditures, higher wage payments, and the importance of foreign affiliates in the merger activity of the industry, will have a tendency to increase the entry barriers facing the potential entrant, as does the increasing market imperfection which the presence of the foreign company seems to enhance. The contribution to entry barriers of the foreign company is greater, on average, than that of their British counterpart, and once again the overall change in industrial structure owes a significant part to the role of the foreign affiliate.

The foreign sector is not homogenous, however, and the differing ownerships reveal differing characteristics.

5.6.1. The U.S. Owned Companies.

Companies under U.S. ownership and control comprise the largest and most merger active of the foreign group operating within the E.I.. The individual companies are, on average, not as large, or as productive as those of E.E.C. origin, but this may be due in some part, to their payment of higher wage levels. (See Table 5.3.)

The U.S. affiliates are less concentrated than their foreign collegues, and do not display as dominant a position of their large companies in the control of labour input as the non-E.E.C. (other) companies, although this is greater than

in the European owned firms.

The U.S. affiliates are not as vertically integrated or diversified as the remaining foreign firms, and these companies display a lesser degree of interdependence but greater specialisation within the individual product mixes. This is supported by the higher levels of R&D expenditure in these fields by such affiliates, implying less parental help and greater technical specialisation. This also increases the level of entry barriers, as does the U.S. affiliate's greater exploitation of economies of scale, and the payment of higher wage rates.

Therefore the biggest contribution to the changing industrial structure of the E.I. from the presence of D.F.I. and in particular the presence of U.S. affiliates, appears to stem from their specialist operations, increasing the level of specialisation within the industry, and their role in helping to increase the level of technical and scale barriers to entry for potential newcomers to the E.I.. The dominance of this group within the flow of D.F.I. to the E.I. also means that they must be held most responsible for the growing addition to the level of productive capacity of the industry by foreign affiliates.

5.6.2. The E.E.C. Owned Companies.

This group of companies represent the second largest foreign stake in the E.I., and relative to their size, are the most merger active (although in absolute terms the U.S. firms must be considered the most involved in the merger/takeover technique).

These companies are, on average, larger than any other foreign affiliate and display the highest levels of labour productivity. As expected, they also have the second lowest sales concentration, with activity being spread reasonably evenly across the whole range of company sizes.

These companies are highly interdependent, with a high level of vertical integration, far greater than any other foreign ownership group. Meanwhile, the activities of the huge Philips conglomerate, especially through its affiliate, Pye, means that the index of diversification is higher than the two remaining sources of D.F.I..

The E.E.C. owned affiliates spend the smallest percentage of turnover upon R&D activities, possibly because of their high degree of involvement with standardised electronic consumer goods. They also provide the least evidence of economies of scale, which can be partially explained by the absence of a large range of company size, and the truncated nature of their operations which means that economies of repetition through assembly line operations can be more important. Also the larger size of most E.E.C. affiliate establishments means that economies are shared fairly evenly amongst all such affiliates, and as our measure shows the increasing scale economies relatively between the larger and smaller groups, the lack of significant scale differences would undervalue the result for this sector.

In conclusion, therefore, the biggest pressures for structural change in the E.I. from the presence of E.E.C. affiliates stem from the high levels of productive capacity growth, and vertical integration, producing large, interdependent

corporate structures.

5.6.3. Affiliates of Other Country Parents.

These affiliates comprise the smallest sector of the foreign companies present in the E.I.. They have the lowest contribution to productive capacity, with the slowest rate of growth of investment in net assets. Low productivity could be largely due to high wage payments, the establishments are, on average, smaller than any other foreign affiliate. Their high level of concentration is exaggerated by the few companies operating compared with the other two sectors, but evidence suggests that the bulk of investment is in the hands of a few large parents. The relatively small size of even these larger investments, will mean a lack of overall impact upon the level of industrial concentration. What effect there is will probably, therefore, lead to an increase in the level of competition rather than a move towards an oligopolistic situation.

Average results for the level of vertical integration and diversification again suggests that such companies do no more than support the effects of the two larger groups. The same goes for entry barriers, with a reinforcement of the results of the two earlier groups of foreign affiliate. In conclusion, this sector is having some effect upon the industrial structure of the E.I., but this is only a minor role because of the lack of real presence.

Thus each group comprising the foreign sector displays its own characteristics and brings a different pressure to bear on the structure of the E.I.. This differing role is

not confined to the foreign companies, however, the British group of firms is certainly not homogeneous either.

5.6.4. Independent British Companies.

The independent companies in the E.I. are much smaller, on average, than the affiliates of larger British companies, and those of the foreign sector, and also have a much lower labour productivity than these firms. They can, however, compete on wage levels and the concentration of labour input in the hands of the larger companies. These companies are reasonably diversified by industry standards and spend almost as much on R&D relative to their size, as the foreign sector. Their contribution to the level of the E.I.'s entry barriers is minimal. There is no doubt that the real impact on industrial structure originates from the larger combines, and that the independent enterprises in the E.I. are responders rather than instigators.

5.6.5. Small British Companies' Affiliates.

The affiliates of Britain's smaller corporate groupings manage to be last in all the rankings of importance within the instigation of structural change, except that they exploit economies of scale to a greater extent than the independent U.K. manufacturer. It would appear that even the small independent company often contributes more to the changing industrial structure than these affiliates of small organisations.

5.6.6. Affiliates of Large British Companies.

It has already been seen that the foreign affiliates seem to demonstrate their multinationality rather than foreignness when competing with indigenous industry in the E.I.. It could be expected that the affiliates of large U.K. owned multinationals would have similar characteristics to the foreign company, therefore. This broadly tends to be the case, with one or two notable exceptions. It is also noticeable that at no point is the role of the average affiliate greater than that of the average foreign affiliate. i.e. The foreign affiliate parallels the development of the E.I.'s structure far more closely than does the average U.K. firm. This implies that a growing number of foreign affiliates will have an increasingly cumulative effect upon the structure of the E.I., bending the degree of market competition towards their own operating principles and, if the theories of oligopolistic reaction are to be believed to any great extent, then towards a more imperfectly competitive situation with increasing dominance of the large foreign affiliate.

These affiliates are usually of an equal size to most foreign establishments, but do not experience the same labour productivity even though wage levels are usually lower. Also the concentration of market power is not high as compared with the foreign sector both abroad and in the U.K.. Probably this is only to be expected, with the large numbers of indigenous firms as compared with the relatively smaller numbers of foreign affiliates who will be expected to display some minimum operating size to overcome the disadvantages of servicing overseas markets by direct production facilities

located abroad.

British affiliates are not as vertically integrated as foreign affiliates, and tend to be more diversified in the product range. They spend less upon R&D and exploit economies of scale only as well as the lowest foreign group. Their role in the changing structure of the E.I. is more important than the other British sectors, because of their magnitude, but also in their individual establishment operations. This is a highly merger active sector, often in response to foreign competition.

5.7. Summary.

5.7.1. The foreign affiliates are expanding productive capacity faster than the British companies, in terms of numbers of establishments, average firm size, and the productivity of individual establishments.

5.7.2. The foreign affiliates maintain this greater productivity despite paying higher wages than the indigenous sector.

5.7.3. The E.E.C. owned firms are the greatest contributors to this growth relative to their total stake, followed by the U.S. owned firms.

5.7.4. The concentration of market power into the hands of the largest companies in the E.I., and the dominance of these firms over the smaller firms of the industry is more pronounced in the foreign sector. There is also some link between the level of concentration of production in the minimum-list-headings of the E.I. and the presence of foreign affiliates.

5.7.5. The foreign affiliate appears in the U.K. market in a truncated form, and displays greater interdependence within its corporate group as demonstrated by higher levels of vertical integration.

5.7.6. The operations of the individual enterprises within the foreign group tend to be more specialised than their British counterparts, as demonstrated by lower levels of operating unit diversification.

5.7.7. The foreign affiliate spends a greater percentage of its turnover on R&D than the average British company, even before making allowance for some understatement due to unspecified parental help.

5.7.8. Economies of Scale are exploited to a greater extent by the foreign affiliate.

5.7.9. Merger activity, particularly that internal to the E.I., is enhanced by the presence of D.F.I., either directly, or by initiating a domestic reaction.

5.7.10. Only the operations of the U.K. affiliate which belong to large international groupings can be meaningfully compared with foreign affiliates in terms of their impact as individual units upon the industrial structure of the E.I..

5.7.11. Foreign affiliates, therefore, tend to display characteristics of multinationality rather than foreignness when influencing the industrial structure.

5.7.12. The precise nature of the impact of D.F.I. upon structure, varies with the origin of the investing firm.

5.7.13. The greatest impact is caused by the U.S. firms but only because of their size and number. Relative to their total stake, the operations of individual affiliates of E.E.C. located parents show the greatest potential for initiating structural change in that they vary most from the average behavioural characteristics of the industry as a whole.

CHAPTER 6.

THE SECONDARY BEHAVIOURAL IMPACT OF DIRECT FOREIGN INVESTMENT.

The major emphasis of the study has been on the role of foreign affiliates in the changing structure of the E.I., concerning itself repeatedly with the factors comprising our definition of 'industrial structure'. However, the role of the foreign affiliate within the changing structure of the E.I. witnessed in Chapter 3, may not be fully explained by the primary behavioural variables of productive capacity, distribution of market power, product and process structure, and entry barriers alone. Attention is now turned to a series of secondary factors, which may well be affected by the operating presence of foreign affiliates, the result of which could lead to a modification or acceleration of the initial impact, and help explain the overall effects noted in Chapter 3.

This chapter, therefore, explores the relationship between company efficiency, performance, location, the domestic reaction to the presence of foreign affiliates, and the influence of such factors upon the industrial structure of the E.I.. Each section first presents a conceptual framework, introducing the assumptions underlying the hypothesis that such a relationship has a meaningful existence, and discusses the contributions of earlier writers to the subject matter. Secondly our own findings on the operations of British and Foreign owned companies in the E.I. are examined. Each of the above factors are taken in turn in an attempt to pinpoint the

role of both sectors in influencing the final effects of these secondary variables.

Answers are sought to questions in five basic areas. Firstly, to determine whether or not foreign affiliates are more efficient than their British counterparts and how this differing efficiency is translated into performance. Secondly, the origin of any variation in overall performance is isolated and the nature of any such differential examined. Thirdly, an attempt is made to determine if the foreign affiliates can be said to display a significantly different location pattern to the indigenous sector, and if so what will be its structural implications. Fourthly, any domestic reaction to the presence of large numbers of foreign affiliates in the E.I. is scrutinised, both at a company and government level, to discover what effects such reactions might be expected to have upon the structure of the industry.

6.1. The Efficiency/Performance Effect.

These two concepts are treated simultaneously as the previous evidence often lacks distinction between the two, and also to facilitate ease of presentation of our own findings. In so far as the differentation is made between efficiency and performance, it is in the area of measurement. The former represents the measurement of several ratios to determine the success (or lack of success) by the company in its operations, using combinations of three variables, namely net profits$^{(P)}$, sales turnover$^{(S)}$, and net asset worth$^{(NA)}$, (i.e. is a rate of return concept.). The latter is a measure of

productivity, of output related to the cost of inputs. Therefore, whilst both concepts are basically concerned with measuring the convertability of inputs into profitable outputs, the former is a rate of return type analysis, concerned with pinpointing the elements of a company's success, whilst the latter is a measure of productivity, taking into account the cost of capital and the cost of labour input.

It has already been suggested that foreign affiliates, whether they be independent or interdependent by nature, may possess certain advantages over indigenous industry, which arise partly from their possession of certain non-transferable income generating assets, and partly because, as part of a larger enterprise, they are better equipped to benefit from the international division of labour. Where such gains are reinvested by the firm in cost-reducing techniques, product innovation, more intensive marketing, R&D, or are passed on to the consumer in the form of lower prices, one would expect, over time, a new affiliate's share of the market to expand.

Many of these advantages should also accrue to the affiliates and parents of large U.K. based multinationals, without the obstacles of transport and tariff barriers. So in an attempt to examine to what extent this increasing importance of the foreign affiliate is due to its greater efficiency, even when measured with comparable U.K. companies. Dunning's 'Social Index of Efficiency' is used to calculate results for each of the six ownership groups in the E.I..

Dunning (1970a; 1973a; 1973b; 1975; and 1979) has already drawn his own conclusions upon the relative efficiencies of British and American owned companies within

the British economy. The findings suggest that differing efficiencies is the single most important factor in the better performance of the U.S. sector. He suggests that U.K. firms are consistently less profitable than U.S. companies, throughout the world, and that the former are also less efficient than a surprisingly wide range of their competitors. The study also suggests that the above is due not to the geographical distribution of such investments, but to the better performance of U.S. investors irrespective of location.

In an earlier study Dunning (1966) drew several conclusions as to the underlying reasons for this differing performance. Firstly that American firms earn higher profit/capital ratios than British companies both in manufacturing industry as a whole, and in the individual industries. Secondly, the main reason for this superior profitability is that U.S. firms earn a higher rate of return on sales rather than having a speedier turnover of capital. (If we allow for centralised, underpriced services, this point can be modified slightly.) Thirdly, American firms show up best when examining their lower administration to total costs, higher labour productivity, and capital/labour intensity. Fourthly, there appears to be some evidence to suggest that these higher profits are to a large extent accounted for by the greater amount of research and managerial expertise open to them from the international group, and the high level of formal qualifications amongst their chief executives, rather than above average worker/employer relationships. Finally, there is little evidence to suggest that the influence of the parent company on local decision making greatly affects the profitability of

the affiliated company, but it does seem that their contribution to both departmental and managerial techniques is a very significant one.

Further studies by Hymer (1960 and 1970) and Vernon (1966) support the view that foreign affiliates display certain characteristics which make them likely to perform better than indigenous firms.

Caves (1971) argues that product differentiation may allow the affiliates to earn 'abnormal' monopolistic or oligopolistic profits, whilst Johnson (1970) sees the superior knowledge and management skills of affiliates leading to higher profit levels.

Care is needed, however, as the dealings of multinational companies are open to global 'handling', and company policy on 'transfer pricing' etc. will affect the final figures. Any business enterprise with a production process which involves transporting semi-finished goods, components or raw materials from one plant to another must, for accounting purposes, set the price at which these goods are transferred, (Transfer Prices). The prices may be set on the basis of marginal cost, or at prevailing market prices (arms length pricing), or such prices may be arbitrarily determined by the firm for the satisfaction of some internal objective.

When the affiliated units have different national locations several other factors will bear upon this decision. Amongst these will be, differential tax treatment, varying levels of competition, rates of inflation, customs duties and the response of host governments. The firm may wish to concentrate their profit for nationalistic reasons, or to

disperse it in order to avoid criticism of disruptive capital transfers, to spread risk, or to avoid adversely fluctuating exchange rates. This extra degree of freedom to set internal prices and thus manipulate internal funds, which is open to M.N.C.'s, is referred to as 'transfer pricing'.

Several channels are available. Pricing of goods and services; interest charges on intra-company debt; royalty payments and fees for other management services; joint overhead allocation, are typical vehicles for transfer payments. This is generally a difficult problem to isolate and quantify when examining affiliate unit data. Taken out of the global context, the single affiliate's returns can often be next to meaningless.

Behrman's (1962) study of U.S. parent companies, clearly demonstrates that the affiliate's profits are subservient to the interests of the whole group. Tugendhat (1971) expands upon more complex pricing behaviour, including protection of funds from interest and exchange rate fluctuations, and short term support for the affiliate. However, the effect of these 'policies' upon affiliates resident in the U.K., given our taxation structure, will tend to be felt at face value, not full potential value, and usually reduce the paper profitability rather than exaggerate it.*

Several reasons also exist to suggest that the setting of transfer prices between the units comprising M.N.C.'s may not have a serious distorting effect, and indeed in the case of the U.K., may tend to reduce the potential advantage of

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*For full support of this argument see J.H. Dunning (1970a)

foreign affiliates, and understate their higher efficiency rather than exaggerating it.

Firstly, evidence from previous sources suggests that transfer prices are set on a cost of production or arms length principle, rather than in an attempt to increase the profitability by reducing input costs to the U.K. units, (Rook 1971). This survey of 300 British companies found that in all cases such criteria were used, with no firms fixing prices on a profit sharing basis. A 1973 investigation of U.S. companies by Stobaugh and Robbins showed international firms to be more conservative in the use of transfer pricing than was previously thought to be the case. The difficulty of assessing the performance of the individual units if arbitrary prices are used, and the effects upon the morale of management from which profits are diverted, place pressures on the parent to use market equivalent pricing techniques. Finally, tax and re-investment considerations make it unlikely that the practice is widely used, Britain's high tax rate and inflation make it unlikely that excessive funds are directed to the U.K..

There seems copious evidence that there exists a differing efficiency between U.K. and foreign companies, and that this is the basis for better performance by the latter. Comparative studies of purely domestic activities show that this poor U.K. performance of recent years is not solely in comparison with multinational affiliates. (see Pratten 1976). Economic efficiency is not easy to assess. Different definitions exist, often based on the relationship of inputs to outputs. Profit maximisation assumptions allow increased profit to be a sign of greater efficiency. However,

from a social point of view it is value added, the returns to labour and capital, which is used as the indicator of efficiency in most cases. Three basic yardsticks can be used. Each one poses problems in data availability and in methodology, because such relationships cannot be measured in a vacuum and must constitute a study of relative data.

Firstly a comparison of the foreign affiliate with the parent organisation and/or other affiliates of the same firm could be made. Here extensive data are required, often of a highly confidential nature, which can only be obtained from the company itself, and intrudes into contentious areas of transfer pricing and internal funding. Also the internal organisation of the company may make such a comparison meaningless. The production components of a world-wide corporation will usually be located for the greatest global efficiency, and not solely for the benefit of the individual units. Even if such complete integration of processes is not the case, and varying degrees of autonomy do exist away from the centre, the allocation of functions within the firm to specific locations may alter the internal input-output relationships. External conditions will affect the observed behaviour and government intervention through tariffs, taxes and direct controls will be a major distorting factor. The response of the various affiliated units to different economic environments within which they are located cannot be standardised.

Secondly the U.K. unit may be compared with affiliates in other countries at a similar level of development. The same pitfalls apply, however, and paramount are the problems of isolating countries of similar market and industrial stru-

ctures, economic environments, government intervention and companies with comparable operations.

Thirdly a direct comparison of indigenous and foreign companies in head to head competitive situations may be made. Here we have the advantage of being concerned with only one country and one industrial setting. One approach is to construct 'paired companies' for comparison. It was considered that data limitations for individual companies (given the anonimity of questionnaire response) meant that construction of comparable grouped samples was far more realistic and accurate. Firms producing the same basic product lines, with comparable input-output relationships, and producing goods at roughly the same stage of the process structure were compared.

Given these alternative approaches it was felt that the last method was most applicable. The data problems of the first two are intractable, and the differences in economic environments within which the units operate, mean that any conclusions that might be drawn would be open to host country influence and distortion. Earlier studies have shown the importance of the influence of the host economy on the performance of foreign affiliates. (A.E. Safarian 1966). Problems still exist with the chosen method but are hopefully reduced to a minimum.

It has already been observed that foreign financed firms in the U.K. earn a higher rate of return on capital employed than their British competitors. Dunning (1966) accounts for this by their lower administration costs, higher labour productivity allied to greater capital intensity, access to subsidised research and the superior qualifications and techniques

TABLE 6.1.

Rates of Return on Capital (P/NA)* of British and American financed firms in U.K. Manufacturing Industry, 1950 - 1974.

Year	U.K. Firms	U.S. Firms	US/UK x 100	
1950	11.1	20.3	183	
1951	10.8	20.5	190	
1952	7.9	15.2	192	192
1953	8.1	16.3	201	
1954	9.6	19.1	199	
1955	9.8	18.4	188	
1956	8.7	13.9	160	184
1957	8.3	14.7	177	
1958	8.1	16.9	209	
1959	9.1	17.0	187	
1960	8.9	13.3	149	
1961	7.5	11.3	151	151
1962	6.8	9.4	138	
1963	7.4	11.5	155	
1964	7.8	12.5	160	
1965	7.4	12.7	171	
1966	7.2	9.7	135	
1967	6.2	8.8	142	150
1968	6.9	10.4	151	
1969	6.4	9.6	150	
1970	6.8	9.5	140	
1971	7.6	9.2	121	120[a]
1972	10.4	12.4	119	
1973	10.2	11.4	112	
1974	N/A	N/A	N/A	

*P/NA = $\frac{\text{Trading Profits - Tax - Depreciation}}{\text{Total Assets - Accumulated Depreciation - Current Liabilities}}$

a. 1970 - 73 only.

Reproduced From:
J.H. Dunning (1966) - US. Subsidiaries in Britain and their U.K. Competitors, Business Ratios, Autumn 1966.

Also J.H. Dunning (1973) - United States Industry in Britain, EAG study, Financial Times.

of management. Dunning also indicates that the gap, however, is narrowing, and his findings suggest that these results are applicable to the E.I. as well as the remainder of the U.K. economy.

The main purpose of this section is to evaluate, and then make use of, a variety of indices of economic performance which demonstrates the different efficiencies of foreign affiliates and domestically owned companies. An attempt is made to locate the origins of any such differentials and discuss their implications for the structure of the E.I..

The analysis proceeds in two main stages. Firstly, three rates of return, namely net profits (after tax and after depreciation) to net assets (P/NA); sales revenue to net assets (S/NA); and net profits to sales (P/S) are presented. Subdividing the data into six ownership groups, as introduced earlier, the figures are compared within the E.I., and with the averages for other industries. The purpose is to find exactly where the different ownership groups' greatest (or weakest) efficiency lies. Secondly, using Dunning's 'Index of Social Efficiency', which makes allowance for the cost of factor inputs, the productivity of the different sectors are compared.

Table 6.1. reveals that in recent years, U.S.-financed firms in the U.K. manufacturing industry (62.6% of all D.F.I.) have consistently earned a higher rate of return on their capital (P/NA) than the average for British companies, but the evidence suggests that this differential is narrowing. Whilst in the period 1950/4 U.S.-firms earned, on average, 92% more on every pound invested than their U.K.-competitors, by 1955/9

TABLE 6.2.

Rates of Return on Sales (P/S)* of British and American financed firms in the U.K. Manufacturing Industry, 1957 - 72.

Year	U.K. Firms	U.S. Firms	US/UK x 100
1957	3.9	5.0	1.28
1958	3.8	N/A	N/A
1959	3.3	6.2	1.88
1960	3.6	5.3	1.47
1961	3.7	5.0	1.35
1962	3.5	4.3	1.22
1963	3.6	5.1	1.42
1964	3.6	5.2	1.44
1965	3.5	5.6	1.60
1966	2.4	4.4	1.83
1967	2.9	3.7	1.27
1968	3.0	4.6	1.53
1969	2.6	4.1	1.58
1970	2.5	4.0	1.60
1971	2.9	3.7	1.27
1972	3.7	4.6	1.24

*P/S = $\frac{\text{Trading Profits - Tax - Depreciation}}{\text{Sales Revenue}}$

Reproduced From: J.H. Dunning (1973) - United States Industry in Britain, EAG study, Financial Times.

this average had been reduced to 84% and to 20% by 1973. Partly this represents a fall in company profitability, but perhaps more importantly, the fact that recent competitive pressures, both domestic and international, have been particularly severe in industries in which U.S. (and other) foreign capital is most strongly concentrated (e.g. Cars, Petrol, Drugs, Office Machinery and Domestic Electrical Appliances).

Tables 6.2. and 6.3. present similar data for the rate of return on sales (P/S), and estimated sales/net asset (S/NA) ratios of U.S. and U.K. firms in U.K. manufacturing.

It can be seen that in general the overall P/S advantage of U.S. firms is very similar to their P/NA advantage, which is interesting as it suggests that the primary reason for the superior profitability of U.S. companies, vis-a-vis their British competitors, is not that they utilise their capital more intensively, but that they earn a higher percentage of profit on output sold. This is confirmed by the data presented in Table 6.3. where the U.S. firms achieved a higher S/NA ratio at the beginning of the period, but which has been eroded to a marginal difference ever since.

Thus there is a hint that the narrowing of the P/NA differential since 1957 has been due as much to a reduction in the sales/capital ratio as to a lowering of profit margins rather than by more efficient capital turnover. The U.S. firm is characterised by some greater efficiency of production technique, therefore, but further support is needed.

The findings from our own survey are presented in Table 6.4.. The results suggest a different conclusion from those for the overall picture of the U.K. economy.

TABLE 6.3.

Estimated Sales/Net Assets (S/NA) Ratios of British and American financed firms in U.K. Manufacturing Industry. 1957 - 72.

Year	U.K. Industry	U.S. Companies.	U.S./U.K.x100
1957	2.13	2.94	1.38
1958	2.13	NA	NA
1959	2.77	2.74	0.99
1960	2.47	2.51	1.02
1961	2.03	2.26	1.11
1962	1.94	2.19	1.13
1963	2.06	2.25	1.09
1964	2.17	2.41	1.11
1965	2.11	2.27	1.08
1966	3.00	2.20	0.73
1967	2.14	2.37	1.10
1968	2.30	2.26	0.98
1969	2.46	2.34	0.95
1970	2.72	2.38	0.88
1971	2.62	2.49	0.95
1972	2.81	2.70	0.96

Reproduced From: J.H. Dunning (1973) - United States Industry in Britain, EAG study, Financial Times.

The findings agree that foreign companies are indeed more efficient than their U.K. competitors, but suggest that the reason for this is based upon the more efficient use of capital, and a speedier sales turnover coupled with greater labour productivity, rather than higher profit margins. Indeed, the foreign affiliates proved less profitable per unit of output than the British sector, it is only the better use of capital to achieve a higher rate of productive turnover that enables such firms to show a higher rate of return on Net Assets at the end of the day. The greatest advantage appears to be in the sales/net assets ratio, which confirms their ability to achieve greater levels of turnover and labour productivity than their British competitors. This fits in with our earlier findings of Chapter 5, where it was discovered that despite paying higher wage rates than the indigenous company, the foreign affiliate was still far more efficient in its use of labour. The S/NA ratio of the foreign affiliates is, on average, nearly twice as efficient in its production levels in relation to capital employed.

'A priori' expectations would suggest that foreign affiliates would utilise more capital intensive techniques. Such affiliates have the resources of their parent organisation to fall back on, and parent support in raising debt and equity capital on more advantageous terms. Several counter-balancing factors, however, exist in that foreign investors have a desire to minimise their capital outlay, not least because of the higher imputed risks attached to foreign ventures. (Y. Aharoni 1967). Another factor is the role of the grant or incentive such as the regional development grant, which eases

TABLE 6.4.

Efficiency Ratios for British and Foreign Owned Companies in the E.I..

Ownership Group	P/NA*	S/NA**	P/S***
Large U.K.	21.0	2.22	11.4
Small U.K.	25.8	2.66	11.8
Indep.U.K.	23.9	2.99	9.1
Total U.K. Mean.	22.7	2.49	10.1
U.S.	18.9	3.02	9.7
E.E.C.	40.8	4.87	6.5
Other	13.4	8.86	5.8
Total Foreign Mean	23.1	4.07	8.3

* P/NA = Pre Tax Profits - Depr. ÷ Net Assets x 100

** S/NA = Sales Revenue ÷ Net Assets.

*** P/S = Pre Tax Profits - Depr. ÷ Sales Revenue x 100

Source: Author's own calculations.

the capital constraints and which the foreign company appears to be attracted by in above average numbers (see 6.2.).

This result is supported by our second approach, the findings of which are shown in Table 6.4..

To the economist, the efficiency of a firm is best measured in terms of output per unit of input employed. Input employed represents the cost of using resources in one way rather than another, i.e. opportunity cost. Assuming only the two basic factor inputs Labour (L) and Capital (K), output per unit of input employed (O/I) can be measured by the ratio:-

$Op/WL + qK$ where :

Op = Value of Output Produced

W = Employee Compensation

L = Numbers Employed

q = Opportunity cost of Capital

K = Capital Employed

Table 6.5. below presents the results of the survey, and it shows clearly that foreign firms are indeed more productive, on average, than their U.K. competitors, with the affiliates of E.E.C. parents showing once again the greatest degree of efficiency whilst the smaller independent U.K. companies are the more productive of the U.K.-sector.

This supports the view that the high level of sales turnover is largely due to the fact that on average foreign affiliates exceeded the average productivity of U.K. companies by 32% (if we can assume that actual employee compensation paid and the input value of capital to be a reasonable indication

TABLE 6.5.

Productivity (Op/WL + qK)* of British and Foreign Companies in the E.I..

Ownership Group	O/I**	Index (100) = U.K.Mean	No. of Cos. > 100
U.K. Large	1.36	101.5	22 (38%)
U.K. Small	1.26	94.0	8 (36%)
U.K. Indep.	1.43	106.7	10 (38%)
Total U.K.Mean	1.34	100	40
U.S.	1.72	128.4	24 (55%)
E.E.C.	2.09	155.0	11 (73%)
Other	1.54	115.0	5 (40%)
Total Foreign Mean	1.77	132.1	40

* q = 12.5% (nominal cost of capital - average P/TA for U.K. E.I.)

** O/I = Productivity result.

Source: Author's own calculations.

of the opportunity cost of inputs employed.) It has already been seen that this is not based on foreign companies selecting the most profitable sectors of the E.I., but is an expression of greater efficiency between directly comparable foreign and domestic companies. Table 6.6. presents comparable foreign and British companies in the individual sectors of the E.I., and the results support this conclusion. It also shows that foreign affiliates outperform British firms in nearly all sectors of the industry, which is not just due to the results of the smaller British companies. Indeed the U.K.-affiliates of large multinationals, who should be in a reasonably strong position to compete effectively with the foreign entrants, are often amongst the worst performers.

Given the earlier results of the efficiency analysis, it could be expected that the foreign affiliates would be more sensitive to changes in the level of 'q'. If the better performance of foreign affiliates is based on their more efficient use of capital, then this should be reflected in a sensitivity to the changing cost of capital.

The index of productivity was recalculated, therefore, firstly with a lower value for 'q' than the notional 12.5%, and secondly with a higher value. The lowest cost of capital as recorded by the cost of bank overdrafts has rarely fallen below 5%., whilst the published data on company accounts suggests that the major companies seldom earn above 20% net return on total assets (at book value) and therefore it seems not unreasonable to take these two values as our lower and upper values respectively for 'q'.

The results indeed show that the foreign returns are most

TABLE 6.6.

Performance* of Foreign and British Companies within the E.I..

S.I.C. Subheading	U.K. Firms	Foreign Firms
Photographic	1.3	1.8
Watches and Clocks	1.2	1.4
Surgical	1.8	2.5
Scientific Instruments	1.5	1.6
Elec. Machinery	1.4	1.8
Wires and Cables	2.2	2.4
Tel. & Teleg.	1.3	2.4
Components	1.8	1.9
Sound Rec. & Br.	2.6	2.7
Computers	1.6	1.9
Radar & Capital Goods	1.2	1.5
Domestic Elec.	1.6	1.9
Misc.	1.6	1.4

* O/1 as defined in Table 6.5.

Source: Author's own calculations.

sensitive to such an analysis and consequently their ability to outperform the indigenous sector increases markedly with lower costs of capital and vica versa with higher values of 'q'. This implies that once a higher cost of capital is imputed into the equation the return of foreign affiliates is seriously affected (at a 5% level the foreign sector outperforms the U.K. sector by 45%, an increase of 13%; and when a 20% value is awarded to 'q', the index of relative productivity for foreign affiliates falls to 24%).

There are several reasons why there should be this discrepency, however, between the overall results of the Dunning analysis, and those of our study of the E.I.. Firstly, since the earlier study of 1966, wages, material costs and inflationary trends have, in general, risen, capital has become more expensive as reflected in the increasing value of 'q', from 11.21% in 1969, to 12.38% in 1972. This has led to a need for greater efficiency and a higher level of sales turnover per pound employed. Secondly, the employees of the E.I., especially those of the foreign sector, are amongst the highest paid of all U.K. workers, and this will tend to lead to a reduction of the profit margins available on each sale, and a drive for much higher rates of labour productivity. Thirdly, the U.S. figure taken in isolation, as in the Dunning study, is certainly the greatest contributor to the P/S figures of the foreign sector, and would certainly have been considerably higher except for a few loss makers present in our study, which could have been atypical, and only evident because of the date of the study when the U.K. economy is going through a particularly recessive section of the business cycle.

Fourthly, the Dunning study shows the E.I. as the second fastest closing of the profitability gap, behind the textiles and clothing industry, and it could be that the gap has finally closed and has been marginally reversed. Finally, the elimination of the profit gap could be due to a change in the competitive tactics of the parent companies involved, with a drive to low price mass production techniques as the emphasis of the technological age changes from 'gimmickry' to standardisation. If this is so it should be reflected in a comparison of the E.I. with other major industrial sectors. Looking at the remainder of the U.K. industries, the E.I. appears to have been most successful at closing the performance gap. If we take P/NA figures for the foreign investors in the U.K. a list compiled of U.K. industries in descending order of their rate of return shows the E.I. a long way ahead of textiles; then bricks, pottery and cement; metal goods; food, drink and tobacco; mechanical engineering; chemicals; paper; vehicles; and metal manufacturing. Examining the profitability of the indigenous sector the pattern becomes metal goods; followed by bricks, pottery and cement; mechanical engineering; and only fourth,the E.I.. This would seem to indicate that even though the productivity gap in terms of profit margins has narrowed, the overall gap on profitability of production is still as wide as ever. The two sets of figures cannot be directly compared as they are admittedly measuring two different sets of data, however, the overall picture still has some significance, and the success of British companies in closing the P/S gap only demonstrates the considerable advantage in labour productivity and efficient capital employment

enjoyed by the foreign affiliate.

This is likely to have an effect on the structure of the E.I.. Naturally, the productive capacity of the industry will be enhanced by the greater efficiency, sales volume and productivity of the foreign affiliate. Scale is a function of the availability and efficient use of the factors of production and technology. The foreign firm has distinct advantages in raising capital, namely access to parental funds, credit worthiness and greater ease of raising equity capital. The availability of centralised know-how, management, marketing and technological, will create advantages over indigenous firms.

This will in turn affect the distribution of market power, with greater concentration of market sales in the hands of the foreign sector. The increased scale of operations, and its inherent R&D expenditures will increase the level of entry barriers, and the greater profitability will release capital for expansion affecting both the product and process structure of the industry. Economies of scale can be further enjoyed, and the ability to finance merger or takeover operations again will affect the structure of the industry.

Thus far, 'internal efficiency', has been the major concern. The higher efficiency and performance of foreign affiliates will raise the overall average efficiency and performance of the E.I.. There is also a wider aspect, namely the transmission of efficiency to the domestically owned sector.

Several mechanisms operating within an advanced economy, enable an assimilation of such increased performance ability by the domestic sector. Firstly, operating through the nor-

mal input/output transactions matrix of the economy the output from a foreign firm used as an input to the U.K. firm may raise efficiency by forcing the adoption of new techniques or simply by being of high quality, causing less waste or embodying technical advances. Alternatively, by demanding high quality, or up to date inputs from the domestic sector, efficiencies may be improved. Such mechanisms are limited by the export orientation of foreign firms, and the low linkage effects between foreign and domestic sectors and the existence of dualism. (see section 5.5. for further discussion.) Secondly, foreign affiliates help create a pool of skilled management in the host country which encompasses both the foreign owned and the domestic sectors, between which a flow of managers developes in both directions. Thirdly, managerial techniques in the domestic sector profit from demonstration effects by the foreign sector. Fourthly, the entry of foreign firms lowers the search costs of finding profitable opportunities for new entrants and established firms. Areas of opportunity for future profits have been pointed to by new entrants. Observation of both management techniques and technology at close hand, is one example. Finally, the increased competition (and demonstrations of success) from foreign firms can provide a 'salutory jolt' to the domestic sector. Also, by paying high wages and competing for staff and other factor inputs the keeness of competition in factor markets is increased

Technological transfer can be limited, however, by the weakness of the domestic sector and by the pervasiveness of proprietary technology in the multinational firm. A large number of respondents to the questionnaire believed that this

was not the case and that a high level of transfer exists in the U.K. because of sectorial overlap and the reasonable level of linkages between the two groups of firms. Also, demonstration effects due to the close contacts established between the respective managers and the interchange of executives were considered to have had a beneficial influence upon the efficiency of the British sector. To some extent this greater profitability could be due to more optimally located foreign affiliates and it is to this the study now turns.

6.2. The Location Effect.

Several authors have already suggested that differing geographical locations can have an effect upon company performance, and it could be that the location decision will have a secondary impact upon the industrial structure.

If a regional variation in company performance is to be explained, then those cost and revenue items must be identified. Industrial location theory has traditionally considered these within a neo-classical framework.

Weber's (1929) perfectly competitive model identified the least-cost site as being the most profitable, laying the emphasis squarely upon transport cost as the significant factor (though allowing for labour cost variation and economies of scale). Losch (1954) developed the market area approach of monopolistic competition and locational interdependence. His firms simultaneously maximise market area, revenue and profits. The increasing sophistication of later models in

no way detracts from the essential veracity of these models.

For the revenue-orientated firm, the final market of high percapita income and population density is attractive. For a firm to whom revenue variables are relatively insignificant, the least cost production site of Weberian theory is determined in the modern setting by variations in transport costs, between raw materials and product differences in factor input costs, urban economies in services, and the availability of government regional financial incentives.

If in the neo-classical fashion, all firms are maximising profits, and locating optimally, there should be no difference in company performance between regions, ceteris paribus. Indeed, McCrone (1969) has some sympathy with this view, whilst Hart and McBean (1961), found no significant difference between the performance of a sample of Scottish firms, and a sample of similar firms in England. This is the consequence of the free location decision and no company consciously locates in an area which is known to be uncompetitive.

There is, however, considerable empirical evidence to suggest that firms do not always locate optimally, either because of the original decision, or because changing circumstances can make a previously satisfactory location deteriorate, and industrial inertia slows down or eliminates the possibility of relocation. i.e. that the historical pull and tradition of the location can still exert a major influence upon the firm long after the economic logic of the situation should identify the need for a relocation decision to be made. Or the high incidence of fixed costs means that an uneconomic site is still more feasible than a move to a new location with the high set-up cost involved, i.e. where the discounted cost

of moving exceeds the benefits. Loasby (1967) confirmed that firms do not marginally adjust to a more profitable site very readily. Luttrell (1962) found that different firms perceived their own environment, experience and idiosyncrasies in varying ways, and not always according to economic rationality. Townroe (1972) confirmed that companies seek a feasible rather than optimal locational alternative.

If this is the case, then the geographical siting of foreign owned production facilities within the E.I. could have an effect upon the overall efficiency and productivity of the industry, and this will in turn directly affect the level and growth of productive capacity. Thus in this section the question of the regional distribution of companies in the E.I. is tackled. The distribution of foreign and indigenous firms is examined, and their relative performance discussed. Finally, an attempt is made to explain why the location pattern of the two groups should be as it is, and the effects that this is likely to have upon the structure of the E.I..

It is expected that location theory is as applicable to foreign affiliates as it is to indigenous firms. Dunning's theory of direct foreign investment as a process of vertical integration, or the Buckley and Casson approach, see affiliates established either to secure resources or factors of production (backwards integration in the Weberian tradition), or to establish and protect markets (forwards integration as Losch predicted).

According to Buckley and Casson (1976) the location decision is constrained by two factors, the incentive to minimise the impact of government intervention through transfer pricing (i.e. a global location policy which includes low-tax countries) and secondly the communications cost of accounting and control information (i.e. communications cost increasing with geographical and social distance within internally coordinated enterprises). In addition there exist location factors which are specifically important to the foreign affiliate. Forsyth (1972) reports that proximity to easy transatlantic transport and communication is an important factor in their location decision. The foreign entrant often takes a wider view of the location alternatives, he is footloose by his very existence, and is not hampered to 'reasonable' or 'feasible' locations through industrial inertia and tradition. Stobaugh (1969) and the U.S. Bureau of Commerce (1972 and elsewhere, see bibliography) also suggest that the parent of a multinational group uses more sophisticated techniques in assessing a wide range of political, fiscal, legal, and social determinants of performance potential. This may be much closer to the optimal location decision than is possible for the indigenous firm, however, if the establishment of the affiliate is functional integration, then the choice may be severly limited (e.g. backward integration assumes raw material based location; whilst forward integration necessitates a market orientation).

Holland goes further. He suggests that large multi-

national companies (which he refers to as the meso-economic sector, i.e. neither micro nor macro) because of their general regional mobility, have the ability to become multi-national rather than multi-regional and actually undermine the power of the modern capitalist state in dealing with regional problems. If this is the case, than the optimality of an M.N.C.'s location decision and the extent to which it is influenced by national governments, will lead to pressures for a change in the structure of the industry in terms of its growth, distribution of market power, the geographical spread of productive processes, and the ability to protect regional markets.

Using Florence's Location Quotient, Izard's coefficient of localisation, analysis of variance, and a simple chi-squared analysis, three hypotheses are tested. (1) There are particular location influences differentiating this industry from manufacturing as a whole, (2) Foreign owned firms locate according to different criteria than domestic indigenous firms. Specifically, foreign investors are less subject to the attraction of the South East, (3) Within the foreign owned group, differences according to nationality of ownership are pronounced. The conclusions will enable a determination of the structural consequences of differential location decisions, and the effect upon profitability and performance to be made.

The investigation is conducted in three sections. Firstly location patterns in the E.I. are compared with

the regional distribution of all British manufacturing establishments. Secondly, locational differences exhibited by foreign-owned firms in the industry from those of the British firms are identified. Finally a test is made to discover differences in patterns of geographical location between the groups comprising the foreign sector according to the nationality of the parent company.

The data are derived from the 1968 Census of Production on the location of establishments and the origin of net output for that year. The regions referred to are the Standard Regions of the United Kingdom as shown in the Abstract of Regional Statistics (now Regional Statistics).*

6.2.1. Location of the Electrical and Instrument Engineering Industry in the U.K..

The location patterns of the electrical and instrument engineering industry (E.I.) and that of U.K. manufacturing

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*The boundaries of Standard Regions changed in April 1974, the data included in this study refers to 1968 and so the pre- 1974 boundaries are used as the Standard Region in this section.

industry as a whole are compared using three methods. The first is Florence's (1958) "Location Quotient" which shows the degree of specialisation of any region by measuring its share of the aggregate number of establishments* in U.K. manufacturing accounted for by the E.I.. Secondly, using Izard's (1960) "Coefficient of Localisation" deviations in location patterns from the national average are measured by contrasting the percentage of total U.K. establishments accounted for by the same region. Regional disparities are then summed to determine the national industry coefficient of localisation measured on a 0 to 1 scale (0 shows no deviation). In other words, this coefficient compares the regional concentration of the E.I. with that of all U.K. manufacturing industry. Thirdly, a simple X^2 test is made of the null hypothesis that the location pattern of the E.I. industry does not differ from that of U.K. manufacturing. The results are shown in Table 6.7..

The results show clearly that industry-specific location factors are very strong in the E.I.. This is confirmed by the X^2 test (X^2 = 227.2 for net output, and 1091.6 for establishments- both significant at 0.0001 level, 10 degrees of freedom) so the null hypothesis must be rejected. Where net output is the criterion, the E.I. strongly favours location in the South East, and to a lesser extent, in East Anglia, and the South West; it is especially underrepresented in Yorkshire and Humberside, East Midlands, West Midlands, and the

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*or net output, where applicable.

TABLE 6.7.

Calculation of Florence's and Izard's Coefficients 1968.

REGION	NET OUTPUT		ESTABLISHMENTS	
	FLORENCE	IZARD*	FLORENCE	IZARD*
NORTH	0.8302	-0.009	0.8485	-0.005
YORKSHIRE & HUMBERSIDE	0.2967	-0.064	0.5400	-0.046
EAST MIDLANDS	0.5857	-0.029	0.6471	-0.024
EAST ANGLIA	1.2730	+0.006	1.0870	+0.002
SOUTH EAST	1.6340	+0.184	1.5319	+0.192
SOUTH WEST	1.2040	+0.184	0.8980	-0.005
WEST MIDLANDS	0.6846	-0.041	0.7417	-0.031
NORTH WEST	0.8323	-0.026	0.6953	-0.039
WALES	0.6429	-0.015	0.9259	-0.002
SCOTLAND	0.8861	-0.009	0.5775	-0.030
N. IRELAND	0.6666	-0.006	0.4444	-0.010
SUMMATION		0.200		0.194

* Obviously here negative signs are possible, however, the summation could be either positive or negative deviations since the percentage distributions are such that the sum of both plus and minus deviations is zero.

Source: Author's own calculations.

North West. However, this differs slightly from the results obtained from the location of establishments. The reason for this is the greater preference of larger firms in the E.I. for regions other than the South East. Results based on establishments differ from those using net output in Yorkshire and Humberside, the South West and Scotland, where a small number of firms contributed disproportionately to net output. This attraction of the provinces for the larger firm can be explained in terms of a number of factors including labour availability, the differential cost of skilled labour, cheap land, the functional separation of production from marketing in large firms, and the development grants which are available outside the more established locations of the South East. These "migrant" firms still tend to locate in the conurbations of Belfast, Glasgow, Manchester and West Yorkshire, thus exhibiting the usual need for communications and market proximity in the assembly orientated branches of electronics. The 'pull' of the South East, the industrial and commercial centre of the U.K., is very strong for this industry, (55.3% of the E.I. is located in the South East, against only 36.1% of all manufacturing).

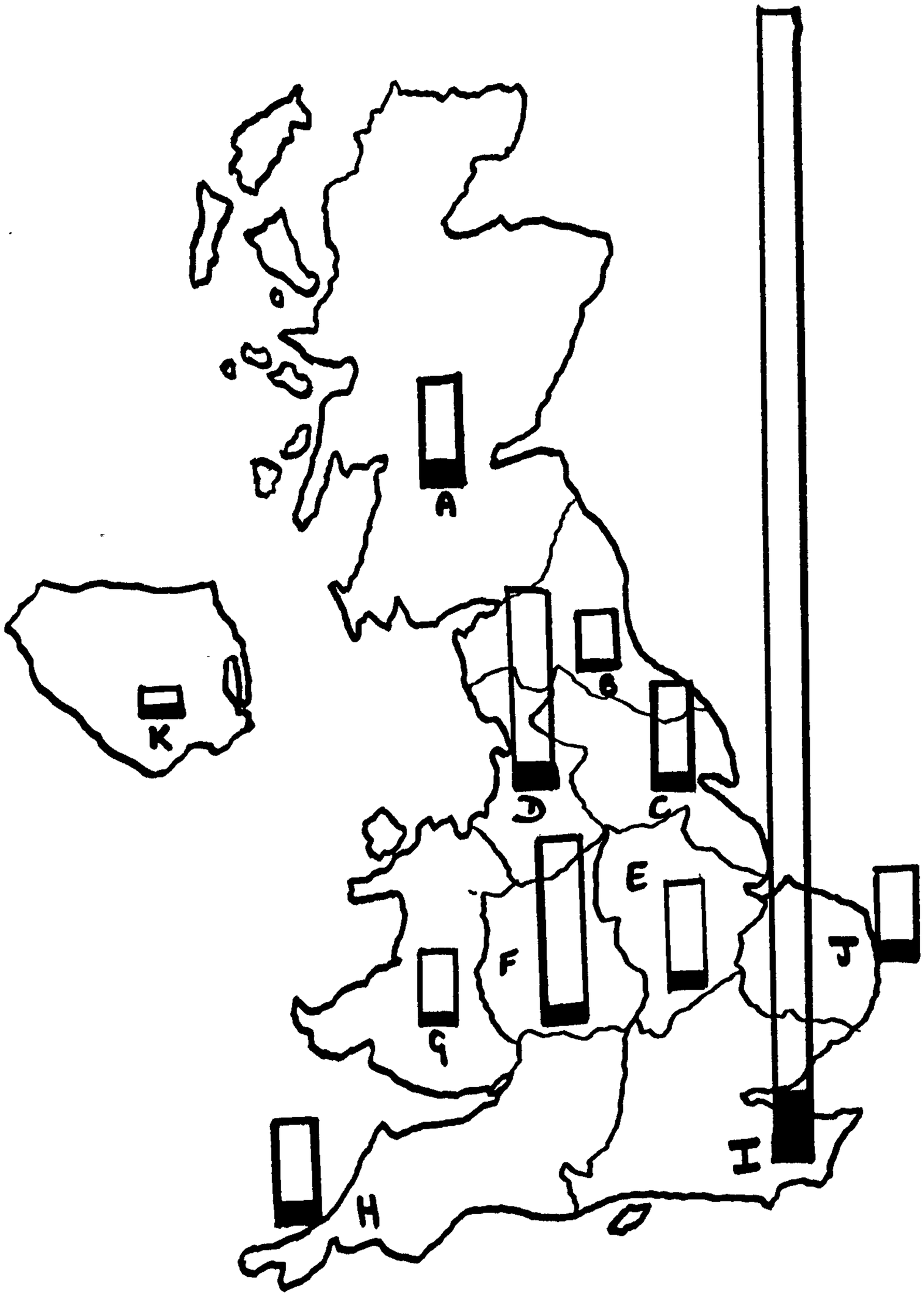
Net output figures proved unavailable in a form disaggregated by ownership, and therefore we continue the analysis using establishment figures only.

6.2.2. Location of Foreign owned Affiliates within the Industry.

Figure 6.1. shows the distribution of the E.I. industry, classified by ownership. Differences in location patterns between British and Foreign owned firms are identified (Figure

FIG. 6.1.

THE REGIONAL LOCATION OF BRITISH AND FOREIGN OWNED ESTABLISHMENTS IN THE UK ELECTRICAL & INSTRUMENT ENGINEERING INDUSTRY.



KEY

British Owned ☐

Foreign Owned ■

A - SCOTLAND
B - NORTH
C - YORKSHIRE & HUMBERSIDE
D - NORTH WEST
E - EAST MIDLANDS
F - WEST MIDLANDS
G - WALES
H - SOUTH WEST
I - SOUTH EAST
J - EAST ANGLIA
K - N. IRELAND

SCALE

1 cm. height = 250 establishments

6.1.) by use of the three methods above. Table 6.8. shows the Florence and Izard analyses of location of D.F.I. as against the U.K. owned sector of the E.I.. Foreign owned affiliates are more than proportionally represented in Scotland, Wales, Northern Ireland and the North, also in the South West and East Anglia. The effect on the latter two regions is particularly significant, largely because of heavy U.S. and Dutch investment. The over-concentration of the E.I. in the South East is not the result of foreign investment, for the tendency noted above, to locate in non-South Eastern conurbations, is stronger in foreign owned firms.

The analysis thus far would tend to suggest that a three tier location characteristic is operating within the E.I.. Fewer firms in this industry set up establishments in the provinces than one would expect from the overall location pattern of U.K. aggregate manufacturing. However, the establishments which are in evidence in these regions are far larger than the average within the E.I.. Both the smaller and larger foreign owned affiliates appear to follow the location decisions of these larger British owned companies, and not the industry as a whole. Thus there is an overrepresentation of foreign owned establishments in regions other than the South East. This 'footloose' quality of the foreign owned establishments would suggest greater appreciation of the industry specific location factors already mentioned, than is exhibited by domestically owned establishments. This is supported by a X^2 test of the null hypothesis that ownership and location are independent, which yielded a result of 95.89 significant at 0.001 level with 10 degrees of freedom. Therefore it must

TABLE 6.8.

FLORENCE AND IZARD COEFFICIENTS OF DEVIATIONS

BETWEEN FOREIGN AND BRITISH OWNED ESTABLISHMENT LOCATIONS

REGION	FLORENCE	IZARD
NORTH	1.179	+0.028
YORKSHIRE & HUMBERSIDE	0.796	-0.011
EAST MIDLANDS	0.667	-0.015
EAST ANGLIA	2.083	+0.026
SOUTH EAST	0.812	-0.105
SOUTH WEST	2.512	+0.062
WEST MIDLANDS	0.473	-0.048
NORTH WEST	0.736	-0.024
WALES	1.792	+0.019
SCOTLAND	2.895	+0.072
NORTHERN IRELAND	3.286	+0.016
SUMMATION		0.223

Source: Author's own Calculations.

be concluded that ownership and location are distinctly related.

6.2.3. Differences within the Foreign Owned Group.

It is possible to extend the analysis by dividing the foreign owned E.I. into three subsections; U.S. owned, E.E.C. owned, and Other. The regional distribution of these groups is shown in Figure 6.2.. A test can now be made for differences in location of establishments between these three groups in the foreign owned sector. The 'F' test of an analysis of variance gives a value of 3.60 (2 and 30 degrees of freedom). This result is significant at the 5% level and the hypothesis that these groups do not differ can be rejected.

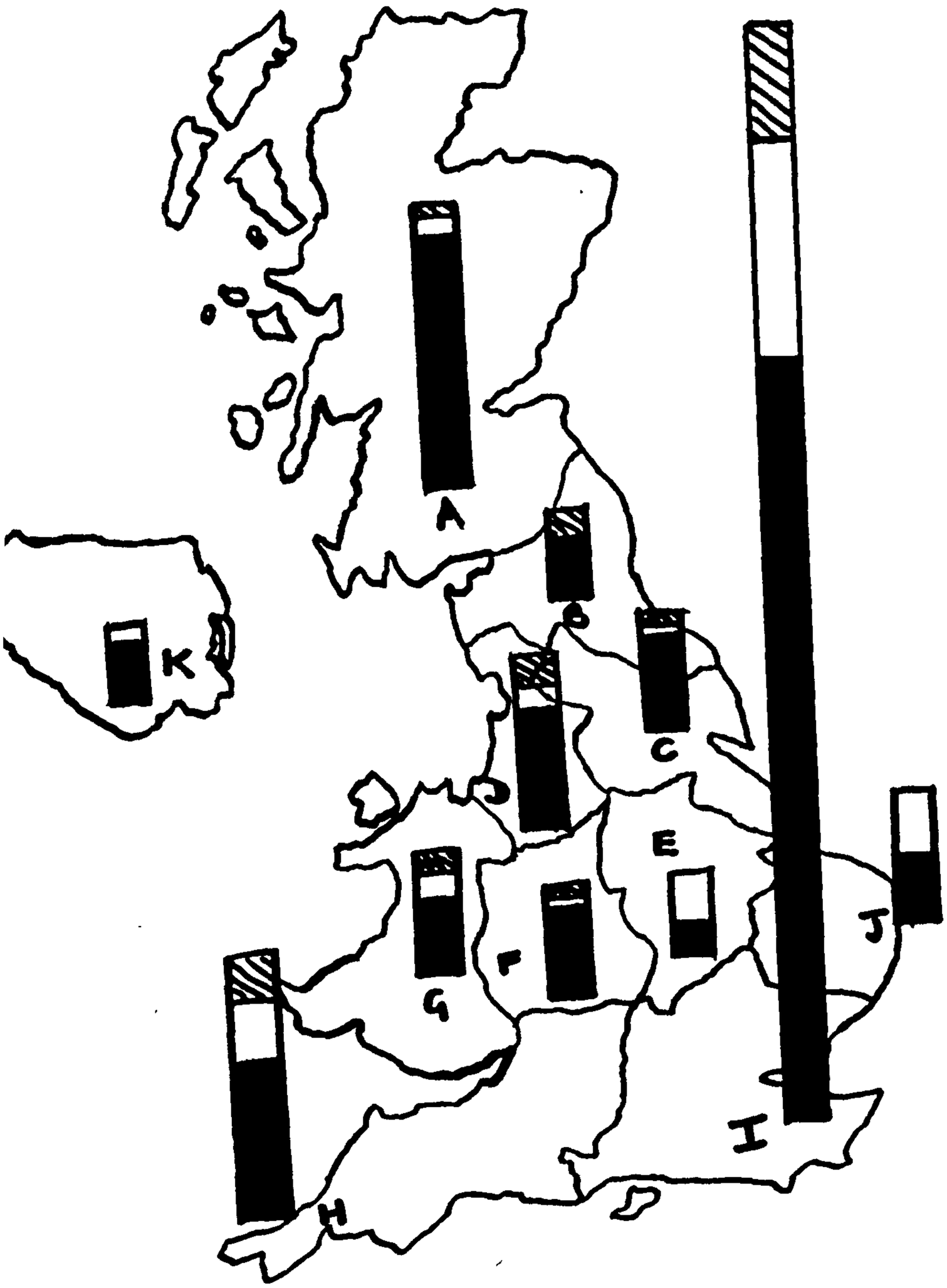
The nature of the deviation can be examined by conducting Florence and Izard tests in order to isolate firstly U.S. owned foreign investment, and then investment from the E.E.C..

Splitting U.S. investment from total D.F.I., Table 6.9. shows that Izard's coefficient is 0.184, supported by a X^2 result of 18.31 (significant at the 5% level 10d.f.). This is largely due to the overrepresentation of U.S.-owned establishments in the North, Yorkshire and Humberside, Northern Ireland, and most significantly in Scotland. The D.F.I. concentration in East Anglia and the South West is definitely not of U.S. origin.

E.E.C. investment cannot be assumed to have the same location pattern as all D.F.I. (X^2 = 27.91 sig. at the 1% level 10 d.f.). Table 6.10 shows that E.E.C. investment is concentrated in the East Midlands, the South East and West, and most significantly in East Anglia. Scotland is greatly underrepresented. It can be deduced from this that the location criteria

FIG. 6.2.

THE REGIONAL LOCATION OF FOREIGN OWNED ESTABLISHMENTS IN THE UK ELECTRICAL & INSTRUMENT ENGINEERING INDUSTRY



KEY

A - SCOTLAND
B - NORTH
C - YORKSHIRE & HUMBERSIDE
D - NORTH WEST
E - EAST MIDLANDS
F - WEST MIDLANDS
G - WALES
H - SOUTH WEST
I - SOUTH EAST
J - EAST ANGLIA
K - N. IRELAND

Other
EEC owned
U.S.owned

SCALE

1 cm. height = 10 establishments

TABLE 6.9.

FLORENCE AND IZARD COEFFICIENTS OF LOCATION OF U.S. AND THE REST OF DFI

REGION	FLORENCE	IZARD
NORTH	1.609	+0.014
YORKSHIRE & HUMBERSIDE	2.217	+0.028
EAST MIDLANDS	0.322	-0.040
EAST ANGLIA	0.351	-0.061
SOUTH EAST	0.947	-0.025
SOUTH WEST	0.624	-0.053
WEST MIDLANDS	1.314	+0.011
NORTH WEST	1.186	+0.011
WALES	0.894	-0.005
SCOTLAND	3.971	+0.104
N. IRELAND	2.333	+0.016
SUMMATION		0.184

Source: Author's own Calculations.

TABLE 6.10.

FLORENCE AND IZARD COEFFICIENTS OF LOCATION OF EEC AND THE REST OF DFI

REGION	FLORENCE	IZARD
NORTH	0.000	-0.042
YORKSHIRE & HUMBERSIDE	0.340	-0.033
EAST MIDLANDS	4.882	+0.066
EAST ANGLIA	4.586	+0.104
SOUTH EAST	1.083	+0.037
SOUTH WEST	1.385	+0.037
WEST MIDLANDS	0.340	-0.033
NORTH WEST	0.704	-0.021
WALES	0.717	-0.013
SCOTLAND	0.256	-0.096
N. IRELAND	0.170	-0.083
SUMMATION		0.244

Source: Author's own Calculations.

of the two ownership groups differ not only from D.F.I. as a whole, but from each other, E.E.C. investment being concerned with transport and communication links, U.S. with regional development grants, cheaper inputs, and commercial centres within the industry.

In conclusion therefore, regions displaying particular attractions for D.F.I. within the E.I. can be identified. U.S. investment would appear to prefer a Scottish location, whilst E.E.C. investment is heaviest in East Anglia and the East Midlands. The remaining foreign investors exhibit a similar location pattern to that of the domestic sector of the E.I.. However, foreign investors still find it essential to obtain a site near a conurbation of some reasonable size and its accompanying facilities, and in doing this, such firms tend to follow the larger migratory firms of indigenous ownership. This footloose quality of foreign owned firms of all sizes would appear to suggest some greater appreciation of locational advantages, or some higher degree of parent fed 'self sufficiency', than their British owned counterparts. Although the traditional pull of the South East for this industry is greater than that for manufacturing industry as a whole, this is mostly due to the location pattern of U.K. companies, not those under foreign ownership.

6.2.4. The Structural Consequences.

Accepting the hypothesis that foreign affiliates appear to have some greater appreciation of the locational advantages of the development areas of the U.K. than their U.K. competitors, the attractions of these regions for the affiliates can

be highlighted. Table 6.11. presents a range of statistics for the standard regions of the U.K. and identifies the relative interest in each region expressed by the location pattern of foreign affiliates. If, as previously suggested in many of the earlier writings, foreign affiliates pursue a more rigorous search for a locational optimum, and take greater account of capital grants and allowances than British companies, this relationship should be demonstrated.

The figures suggest that foreign affiliates are attracted to areas of increasing growth, and tend to ignore areas of little or no growth. These are not necessarily the biggest regions (in terms of their contribution to G.N.P.), in fact foreign affiliates are often found in above average numbers in the smallest regions. This possibly suggests that regional potential is more important to those investors than present scale.

Foreign affiliates are also found in areas of the highest and most persistent unemployment (exploitation of a cheap labour input?). It is noticeable that they are also located in areas of the highest labour productivity, although this is a circular argument, with causal direction difficult to isolate. (Later evidence will suggest that it is the increased activity of foreign owned firms that helps to exaggerate this regional disparity.)

Foreign affiliates are attracted to regions where financial incentives are available and also where the E.I. is an important contributor to the region's industrial activity. The foreign group is not homogeneous, and it was suggested earlier that different location patterns, evident for E.E.C.

TABLE 6.11.

Regional Statistics of the E.I..

STATISTICS Direction of Growth of Share of G.N.P.	Stable	Falling	Rising	Rising	Falling	Rising	Falling	Falling	Stable	Rising	Falling
1975 Share of G.N.P. (%)	5.0	8.1	6.3	2.9	35.3	7.0	9.2	11.1	4.1	8.7	2.0
1975 Share of Employment (%)	5.6	8.7	6.5	3.0	32.2	6.7	9.7	11.8	4.4	9.1	1.3
Unemployment (%)	8.1	8.3	5.6	2.5	21.3	7.6	9.6	15.3	6.0	11.5	4.3
Duration of Unemployment U.K. av. = 100	124.6	97.1	85.5	88.4	78.3	115.9	98.6	124.6	123.2	120.3	163.0
Net Output per Employee £000's	2.17	2.50	2.50	6.08	2.87	2.42	1.62	2.75	2.86	2.94	2.7
Importance of E.I. in Regions G.N.P. (%)	9.3	4.0	5.3	5.5	16.4	11.1	10.3	9.3	9.7	10.5	6.6
Gov. Grants (%)											
Plants, Mach, & Works.	28.5	4.8	0.4	-	-	1.3	0.1 (inc.)	12.8	12.6	26.3	13.2
Other Grants (%)	48.3	1.1	1.1	-	-	8.2	(in) (EM)	14.3	8.0	19.1	-
Foreign Interest.	All esp. U.S.	U.S.	E.E.C.	All esp. E.E.C.	Some E.E.C.	All esp. E.E.C.	Little	All	All esp. U.S.	All esp. U.S.	U.S.

Source: Abstract of Regional Statistics (Various Issues) H.M.S.O.
Author's own Calculations.

and U.S. owned affiliates in particular, are based on a differing location decision evaluation, which is not similar to the overall pattern of D.F.I. location as shown in Table 6.12.. The E.E.C. affiliates are particularly attracted to areas of the highest potential growth and available transport facilities. They also locate in the areas of greatest labour productivity and where the region has a large stake in the E.I.. Meanwhile the U.S.-owned affiliates are more prepared to go even further into the provinces and to Scotland, Northern Ireland and the North East in particular. They are more attracted to sources of cheap labour with high levels of persistent unemployment, and the availability of capital allowances and other financial incentives. Finally, they are also located in the areas where the E.I. contributes an above average share of the economic activity of the region. However, could it be that this merely reflects the overall pattern of foreign investment in the U.K.? Table 6.12 shows that this is not the case and it can only be concluded that industry specific location factors are being appreciated in the decisions of the foreign investors of the E.I..

The evidence suggests, therefore, that foreign investors, for several reasons (not always identical) locate throughout the regions of the U.K. in a completely different pattern to their U.K. competitors. This could be one further explanation for the increased profitability of foreign affiliates. This is supported by evidence from our survey, where foreign affiliates in the development areas of the U.K. were equally as profitable as those located in the southern regions, if not more so.

TABLE 6.12.

Percentage of British Regional Employments, Sales and Net Capital Expenditure Accounted for by Foreign Enterprises.

All Industry.

Region	Employment	Sales	Net Capital Expenditure
North	2.1	3.7	3.0
Yorks. & Humberside	2.5	3.1	3.4
East Midlands	3.3	4.8	3.6
East Anglia	11.2	11.7	14.3
South East	10.3	16.5	25.3
South West	1.2	1.1	1.7
Wales	8.5	13.9	11.0
West Midlands	4.1	5.7	7.6
North West	5.6	8.0	12.2
Scotland	7.2	7.0	9.9
Total (G.B.)	6.8	9.2	12.3

Reproduced From; Steuer et al. (1973) Table 10. XlX.

Therefore, this increased appreciation of locational advantages provides further pressure for increased productive capacity and therefore increased concentration of market power into the hands of the foreign affiliate. Along with this goes the ability to raise barriers to the potential entrant and the likelihood of functional diversification and integration based on sound understanding of regional advantages and facilities.

6.3. Domestic Reaction.

The penetration of the E.I. by foreign affiliates, and the resulting pressure for a change in the structure of the industry, will also have one further, secondary pressure, that is caused by the competitive reaction of indigenous firms to the foreign affiliates.

This reaction may be subdivided into four major areas within which a company may respond. Firstly, the competitive tactics of the firms comprising the indigenous sector may change, and internal rationalisation or expansion into new fields may be the result. Secondly, a firm may undertake a merger/takeover strategy to enable a new profile to be operated in the least possible time. Thirdly, the indigenous company may leave the field open to the foreign affiliate and avoid a head to head confrontation, either by altering the emphasis of its market approach, or by investing outside the U.K.. Fourthly, the government may become involved in the operations of the foreign investor, either directly, or by initiating a domestic reaction within the U.K. companies.

Up to this point emphasis has been placed on a consideration of the distinctive behaviour of the affiliate of foreign M.N.C.'s and their effect upon the industrial structure in general, and the E.I. in particular. It is only natural that just as every action sponsors a reaction, then similarly, the indigenous sector will pursue some form of reactive policy as outlined above.

The reactions of the domestic sector will depend upon their own structure, efficiency and competitive strength and strategy. Where scale economies are relatively unimportant, the presence of foreign companies may stimulate competitors, and an improved market structure may be attained. Where there are scale economies present, then effective competition may only be possible through merger or takeover strategies, which will lead to a secondary increase in the concentration ratio, i.e. the potential threat of foreign penetration as well as the actual presence of foreign operators, may be sufficient to instigate a change in the structure of the U.K. industry as a defensive reaction.

The E.I. has already demonstrated its ability to generate situations where economies of scale are present, and therefore this pressure for structural rationalisation is likely to be meaningful for our analysis. In other industries examples are available. The retail trades reaction to Woolworth's and Wilkinson Sword's strategy in the face of Gillette, B.L.M.C., Plessey and I.C.L. are good examples of defensive combinations in their own fields.

This, of course, assumes a positive form of defensive position, however, domestic reaction can be negative. British

companies can be forced out of business, or move out of the sectors involved to avoid confrontation with the foreign entrant. (e.g. U.K. typewriter industrial reaction to foreign penetration). Often they respond by product or process diversification (e.g. as in some sectors of the domestic electrical goods industry).

Such rationalisation on either a defensive or aggressive basis can help mould the industrial structure. The ability of indigenous firms to successfully oppose the foreign entrant is another important factor. It has already been seen that the failure rate in the E.I. is far higher for indigenous firms than for foreign companies, and Stopford (1975) has already suggested that, where possible, British companies do avoid direct confrontation with foreign M.N.C.'s, and that increased D.F.I. in the U.K. and around the world, has led to increased British investment within the relatively advantageous Commonwealth. Whilst Table 6.13 demonstrates such a capital flow, the figures also show, however, that increasing amounts are being directed towards the more competitive markets of the U.S., E.F.T.A. and particularly the E.E.C..

This would seem to support the view that British companies are taking an aggressive view of the situation both international and domestic. All such reactions, coupled with government policy would in turn have some effect upon the structure of the industry.

The competitive tactics of the U.K. owned firms will tend to respond to the presence of foreign affiliates. The British based affiliates of large scale M.N.C.'s and their parents are capable of head-to-head competition. Others may

TABLE 6.13.

Book Values of Overseas Direct Investments from the United Kingdom, by Territory, 1962-71.*

	1962	%	1971	%	% Growth
Developed Commonwealth	1470.1	43.2	2795.5	41.9	90
Developing Commonwealth	936.0	27.5	1322.3	19.8	41
U.S.A.	301.3	8.9	794.7	11.9	162
E.E.C. (the six)	272.9	8.0	985.2	14.8	261
E.F.T.A.	82.8	2.4	192.2	2.9	131
Other	341.9	10.0	577.0	8.7	69
Totals	3405.0	100.0	6666.9	100.0	96 (average)

* Excludes oil, banking, insurance.

Source: Department of Trade, 15th. November 1973

Trade and Industry

feel that they can only protect their markets by 'follow-my-leader' tactics, and the direct effects of foreign entry may be duplicated in the indigenous sector. Here the form of entry and type of competitive structure adopted by the foreign affiliate will be crucial. However, probably more important is the effect on the size structure of firms in the industry and the degree of capacity utilisation. In capital intensive industries, where the market is small, and the competitive structure of the investing company is duplicated, then no firm might be able to produce at its optimum size. This has certainly happened in Canada, Australia and New Zealand (Brash 1972; Watkins 1970; Grey 1972; Parry 1973), also in some of the smaller European economies, and in many of the less developed countries. It is possible, therefore, for both concentration ratios and excess capacity to be extended at the same time, especially if the motivation for such investment should be defensive in nature (Baranson 1969 and 1970).

As production becomes more and more international, then so does market structure. In particular those industries which are oligopolistic or monopolistic in nature tend to duplicate this structure abroad (Rosenbluth 1970; Knickerbocker 1973). As affiliates of foreign parents gain their economic power, relative to indigenous industry, from being part of a larger, internationally diversified organisation, it is only to be expected that some alien business and market ethic will be imposed on the host country industry, The reaction of domestic companies will be determined by their ability to effectively compete within this new doctrine.

In the face of structural change within the E.I. the

indigenous companies have reacted for the main part aggressively. Their competitive tactics, based upon a large sector of British owned multinational parents and their affiliates have duplicated those of their foreign competitors. This is only to be expected, given that all large M.N.C.'s have similar breeding grounds and business ethic. Something, in fact, which transcends national characteristics, for the very largest companies. Their success, however, can only be judged on the evidence of the previous two chapters. The performance gap appears to be closing in most areas and has already closed in a few sectors of the E.I..

Aggressive expansion through takeovers and mergers within the British sector is also in evidence. Some of the amalgamations which have taken place in the E.I. in an attempt to fight the foreign competitor have already been highlighted, and naturally such rationalisation can only have a profound effect upon the structure of the E.I.. The government's reaction to D.F.I. is another important factor.

The Unilateral type of government policy will be directed towards advancing economic and social objectives, and it is often by such criteria that the effects of inward direct investment will be judged. Sometimes, however, the achievement of such goals may conflict; thus foreign affiliates may be more efficient than indigenous competitors, but may worsen the balance of payments or exacerbate inflation. Action taken to remedy certain of these objectives may conflict with our best perception of the form of market structure. i.e. The effects of foreign affiliates upon market structure are often not treated in isolation to other consequences of their acti-

vity, and it is possibly unreasonable to expect that they could be. Also, firms react to economic indicators, and the government's ability to respond favourably within the Macro Concept may be limited. Further, the policy instruments available to deal with the domestic sector, may not be fully applicable to the foreign owned affiliate.

Among the general policies of host governments which affect market structure and behaviour, some are specifically directed to this end, whilst others incidentally affect it. Of the latter we are referring to questions of overall industrial policy and the allocation of resources between the industrial sectors. The former type of policy relates to the market structure of particular industries, which is framed to encourage both economic efficiency and an equitable distribution of the proceeds between the agents of production. Another approach is for the government to directly control the operations of the foreign affiliate or encourage more indigenous competition to their operations. Often inter-governmental co-operation may be needed, and the cross-frontier merger is one example of this. However, any multi-national uniformity of legislation aimed at controlling these corporations is still a long way off.

The policy of U.K. governments has generally been non-discriminatory towards foreign affiliates once established in the U.K.. Prior to entry certain safeguards are often required, but enforcement could be a difficult operation. Only very rarely have such takeovers been disallowed, and most controls relate to questions of finance. This is not to say that the British government has been neutral towards the eff-

ects of foreign controlled companies on market structure, and especially to the growing concentration of foreign investors in certain sectors such as the E.I.. The response, though, has been mainly to encourage countervailing power and general competition, rather than to curb the activities of foreign affiliates. However Kanter and Sugerman (1970) point out that the threat of referal to the Monopolies Commission has been known to frighten off potential U.S. bidders.

The most noticeable recognition by government of the possible impact of foreign affiliates on British industrial and market structures was given in the setting up of the I.R.C. in 1966 to encourage the reorganisation of industry and to promote or assist the establishment or development of any industrial enterprise. For the most part the I.R.C. was more concerned with helping British companies to compete more effectively against large foreign companies in the international and domestic market. This is most clearly seen in the E.I.. In 1967, the I.R.C. supported the merger between Elliott Automation and English Electric to form A.E.I., Britain's then largest electrical firm, and in the following year between General Electric and A.E.I. to create the General Electric-English Electric Company, now a world leader in Electronics and Electrical Engineering. The rationale of this latter merger was to provide more effective competition to the giant U.S. firm I.T.T. (and its British subsidiary Standard Telephones and Cables). The I.R.C. also helped pave the way in 1968 for the formation of I.C.L., which brought together International Computers and Tabulators, the major British computer firm; the data processing interests of English Electric;

investment and future co-operation of Plessey; and £36m. of government support. This important reorganisation created the largest non-American computer group in the world and provided a direct challenge to I.B.M.. However, a more imaginative differential treatment with regards the performance, and transfer pricing policies of foreign investors and indigenous companies might have enabled the Monopolies Commission to exert more of an influence on the structural effects of the operations of foreign affiliates.

6.4. Conclusions.

Earlier writers present evidence to suggest that foreign affiliates in the U.K., on average, outperform their indigenous competitors, and that this is due to greater efficiency based upon a higher rate of profitability on sales rather than increased sales turnover, and higher levels of labour productivity and management capability. Secondly, that foreign affiliates are in a position to exploit 'abnormal' monopolistic or oligopolistic advantage, coupled with greater economies in the international division of labour. Thirdly, these affiliates have the ability to use more sophisticated techniques to achieve a sounder economic location decision, albeit, sub-optimal, than the comparable British company, and that this could be an aid to greater profitability and better performance. Finally, that the reaction of indigenous firms can, and will, effect the overall industrial structure by their defensive or aggressive pose towards the foreign firm.

This can be compared with the empirical evidence with

particular reference to the E.I.. Firstly, it was suggested that foreign affiliates were, on average, more efficient than their British competitors, and that this might be translated into performance differentials. The evidence of previous writers supports this, and that the greater efficiency of foreign affiliates has led to a higher rate of return on sales. Our own findings agree with this general conclusion, although the gap has closed consistently throughout the past 25 years.

Secondly, the origin of such greater efficiency was questioned with particular reference to the E.I.. Previous findings suggested that a higher profit margin on sales was the origin, but our empirical findings show that the increased efficiency of foreign affiliates stems from a greater labour productivity, and improved use of net assets to generate a speedier turnover of sales. i.e. smaller profit levels, but much higher numbers of items sold. The E.E.C. companies were the most efficient, particularly when measured via rate of return on assets employed, with the U.S. owned affiliates showing up best on profit margins, but not as favourably as the U.K. figures. Again the foreign affiliates were, on average, more productive, this being particularly true of the E.E.C. group, who were on average 55% more productive than the U.K. mean. This increased efficiency held for almost all the sub-headings of the industry.

Thirdly, it was found that the foreign affiliates do locate within the regions of the U.K. in a pattern different from both the U.K. sector of the E.I., and the overall pattern of D.F.I.. Also, the three ownership groups within

this sector display different characteristics. The foreign affiliates are not necessarily attracted to the largest areas, or to the over-concentrated southern regions. They move to regions with growth potential, financial incentives and labour availability. Within the foreign group, E.E.C. investors are concerned with transport and communication links, whilst U.S. affiliates are attracted by regional development grants, cheaper inputs, and the commercial centres of the industry.

Fourthly, the government can have an important influence on the development of the industry's structure, either by direct influence, or by sponsoring a competitive reaction. The policy of U.K. governments has generally been non-discriminatory towards foreign affiliates once established in the U.K., and whilst the response has been mainly to encourage countervailing power and general competition rather than to curb the activities of foreign affiliates in some selective manner, the threat of potential discrimination (e.g. referal to the Monopolies Commission) has been known to frighten off potential foreign bidders. The governments' regional policies will influence the location decisions of both foreign and domestic investors, and the efficiency of these operations. Such interaction means that such secondary variables have an impact and an important role to play in the decision affecting both the destination and behaviour of foreign and domestic companies in the U.K. economy.

There is obviously some interaction between the variables; Efficiency, Performance, and Productivity will

all be affected by the optimality of the location decision, and the attitude of the government to the foreign investor, and the domestic reaction of the indigenous companies. The cumulative effect will be to bring pressure on the market and industrial structure of the E.I. and the movement will be towards increasing productive capacity, rationalisation of the product and process structure, increasing concentration of market power, and increasing entry barriers. The productive capacity of the industry will be enhanced by the greater efficiency, sales volume, productivity and optimality of the location decision of the foreign affiliate. Scale is a function of the availability and effective utilisation of the physical factors of production, technological and managerial expertise. The better performance of foreign affiliates will increase the level of productive capacity and this will in turn influence the distribution of market power, with greater concentration of market sales in the hands of the foreign sector whose numbers and average firm size is increasing more rapidly than that of the indigenous companies. This increasing imperfection of competition (given the more oligopolistic nature of the foreign firm's activities), the ability of such affiliates to better exploit economies of scale, higher R&D expenditures and higher wage payments, will bring a pressure to bear leading to an increase in the existing levels of entry barriers. Their greater profitability will release capital for expansion affecting the product and process structure, as foreign affiliates display higher levels of corporate interdependence than U.K. companies. Economies of scale can be further enjoyed, and the ability to finance merger or takeover opera-

tions will again affect the distribution of market power and the level of entry barriers.

This conclusion supports the noted changes in Chapter 3, and we must conclude that these secondary variables have influenced the change in industrial structure of the E.I. and that the exact nature of the impact varies with the size and geographical origin of the affiliates present in the industry.

6.5. Summary.

6.5.1. Foreign affiliates, on average, are more efficient than their British competitors.

6.5.2. Such increased efficiency has been demonstrated in a higher rate of return on sales.

6.5.3. The gap between the domestically and foreign owned sectors is closing, possibly largely due to the successful transmission of efficiency between the two groups of companies.

6.5.4. The higher efficiency of the foreign sector stems from greater labour productivity and better use of net assets to generate a speedier turnover of sales.

6.5.5. The affiliates of parents based in the E.E.C. proved to be the most efficient in their rate of return on assets employed, whilst the U.S. owned affiliates exhibited the highest profit margins.

6.5.6. Foreign affiliates are, on average, more productive, this being particularly true of the E.E.C. group, who were 55% more productive than the U.K. mean.

6.5.7. The higher performance is true throughout the minimum-list-headings of the E.I..

6.5.8. The regional location pattern of the foreign affiliates differs significantly from that of the indigenous group.

6.5.9. The three foreign groupsdisplay significantly differing patterns of location.

6.5.10. Foreign affiliates are attracted to regions of growth potential, financial incentives and labour

availability.

6.5.11. The E.E.C. group firms are concerned with transport and communication links; U.S. affiliates with regional development grants, cheaper inputs and the availability of commercial centres.

6.5.12. The U.K. government has played a role in the domestic reaction to foreign affiliates which is helping to restructure the E.I..

6.5.13. The structural changes mentioned in Chapter 3 and the influence of foreign affiliates charted in Chapters 4 and 5 have been further influenced by the above secondary variables.

6.5.14. These variables have aided the expansion of production capacity, the redistribution of market power, the increased level of vertical integration and lower levels of diversification, and the increasing level of entry barriers.

CHAPTER 7.

CONCLUSION .

It was suggested in the Introduction to this study that three major contributions would be made, implying the need to investigate several areas of interest. These were to be; (1) a synthesis of a complexity of theoretical and empirical material upon the subjects of industrial and market structure and their measurement, culminating in a simplified, yet comprehensive, modelling of industrial structure; (2) a charting of structural change utilising the model, with particular reference to a case-study of the Electrical and Instrument Engineering Industry (E.I.); (3) an appraisal of the ways in which direct foreign investment (D.F.I.) can become a significant factor in the process of structural change in the industries of the U.K., again using the E.I. as the basis for empirical examination; (4) the provision of new data upon the subject via a survey of over 500 companies of U.K. and foreign origin, with which to test the validity of the model; (5) the drawing of conclusions of general applicability concerning the role of foreign affiliates in the changing industrial structure of the E.I., and an attempt to identify those variables which are most influenced by the differing geographical origins of the foreign company; (6) the identification of future implications for research and predictions of the possible ramifications of increasing foreign involvement and technological change in the E.I..

This task has now been completed and conclusions can be drawn as to the success of the study in achieving these objectives. Difficulties were obviously encountered, and these too must be summarised. The lack of official data in any quantity on the breakdown of D.F.I. activity in the U.K.; the lack of statutory requirements for financial reporting by affiliated companies; the cost and time involved in data collection by the independent researcher; the constraints of the postal questionnaire technique for eliciting information; inaccurate and often conflicting data from official and mass media sources; and the unwillingness of companies to provide data upon which efficiency comparisons may be compiled in times of atypical economic performance, are all obvious examples of the problems faced in any such research. In general, however, the author was eventually satisfied with the availability and statistical validity of the data presented in this study, whilst making a plea for increasing collection and collation of material by official sources, in particular in the field of takeovers and mergers involving overseas companies.

7.1. Methodology.

Chapter 1 demonstrated the complexity of methodologies which have been suggested by researchers of industrial structure, and the plethora of definitive statements covering all aspects of the subject area. Most previous studies have concentrated upon empirical testing of various parts of the model, or attempted a description of the changing

nature of aggregate structure. Few have explained the changing structure within a major industry, even less have attempted an overall model of structure whilst providing new data with which it can be tested. Only a small number of researchers have linked changing industrial structure with the activity of foreign affiliates and none would appear to combine all of these with an explanation of the mechanisms by which D.F.I. might affect the structure of a major U.K. industry. This study attempts just that, the vehicle used being a case-study of the E.I..

It was originally considered that an econometric model might be constructed to describe the interaction of variables considered essential to the definition of an industry's structure. This proved an extremely complex operation, and data deficiencies finally eliminated such an approach early in the research. Therefore the variables are presented independently and where necessary, interactions are discussed in the text.

A case-study approach was utilised as this affords the opportunity to examine in depth the operations of foreign affiliates and their impact upon industrial structure, the concentration of subject matter allowing for a greater focussing of the limited research resources of the doctoral student upon a tighter area of interest. The E.I. was chosen because of its importance to the U.K. economy, the industrial importance of the technological revolution taking place within the electronics sector at present, its noticeably changing industrial structure, and its obvious attraction for foreign investors. A study of

this nature was considered more relevant to an understanding of the process of structural change than one of a more aggregate nature.

The breakdown of the survey sample into six areas of interest; affiliates of U.S. parents; affiliates of E.E.C. based parents; affiliates of other countries' parents; affiliates of large multinational U.K. companies; affiliates of small domestic U.K. groups; and unaffiliated independent U.K. companies, proved successful in identifying the differing contributions of the various sources of ownership to the changing structure of the industry. This was important in discerning which characteristics of affiliate activity represented their 'foreignness' or were simply an expression of their 'multinationality'.

An extremely good response to the postal questionnaire allowed data upon 279 companies to be analysed (55.8% of the sample). This comprised 68 U.S. owned firms; 24 from the E.E.C.; 20 of other national ownership; 90 affiliates of large U.K. corporations; 39 smaller U.K. companies; and 38 independent U.K. firms. This high level of response was probably due to a combination of factors, including the simplicity of the questionnaire; the required financial data being readily available to the affiliate's management if not always to the general public; the initial approach being made to the Managing Director or equivalent person of seniority; the anonimity of the response (although the forms were coded by their ownership group as above); and the length of time allowed for completion (approximately three months in all). Data deficiencies were sometimes

covered by the use of company accounts, Extel cards, industrial classifications and direct telephone calls to companies. Even when companies refused to complete the questionnaire, or had been liquidated, the response (usually a letter of refusal) often contained some useful information. The answers were aggregated on a horizontal, rather than a vertical basis (i.e. all the responses to question 1 were added together, rather than totalling the answers to each questionnaire individually), and this meant that even incomplete returns were still of some use. Managers were allowed space to comment on some of their answers, and where possible these are incorporated into the text.

7.2. The Model of Industrial Structure.

In Chapter 3 the model of industrial structure was presented. Two sets of variables were identified, and because they are both determined by the behavioural characteristics of the firms comprising the industry they were termed "behavioural variables".

Four variables were identified by which changes in industrial structure could be measured directly. Because these were directly and immediately influenced by any modified behaviour pattern of companies attributed to the industry, they were termed the "primary behavioural variables", these were; the level of productive capacity (measured by sales turnover); the distribution of market power (sales and employment concentration, and merger activity); the product and process structure (indicies of vertical

integration and diversification); and the ability of the industry to protect itself from potential entrants (entry barriers such as economies of scale, production overheads and the presence of merger activity as a means of circumnavigating such barriers).

A second set of variables were also considered important to the final profile of industrial structure, but working in an indirect way, influencing the primary variables. These were the efficiency and performance of operating companies (as measured by their productivity under Dunning's "index of social efficiency", and partial efficiency measures of varying rates of return on sales, net assets etc.); the location patterns of firms and the domestic reaction of indigenous firms and/or governments to the entry of foreign affiliates (measured by the traditional Florence and Izard Location Coefficients and the changing attitude of government policy and company activity to foreign affiliates respectively). A significant change in any one or more of these could result in a modification of the primary variables.

Spearman Rank Correlation Coefficients of the primary variables across the industries of the U.K. economy were presented in Chapter 3, and these demonstrated the significant relationship which exists between these characteristics and supported the hypothesis that the existence of D.F.I. is related to industrial structure as defined by these variables. It was therefore concluded that the presence of foreign affiliates in an industry could possibly be related to, and have a part to play in, the changing nature of industrial structure of an industry.

Analytically the model introduced two types of impact D.F.I. might have upon the structure of an industry, namely one of 'Destination' and one of 'Behaviour'.

The Destination impact is one which can be felt at either an Economy or an Industry level (i.e. that by locating in certain patterns throughout the industries of the U.K. economy or throughout the minimum-list-headings of a particular industry, changing patterns of investment could lead to a reallocation of resources and changing patterns of development between and within industries, in such a way as to cause changes in industrial structure). The Behavioural impact stems from the differing operating characteristics and behaviour of individual firms even within the same minimum-list-heading of an industry. This we term the Firm-level effect (see Section 3.1.2. and 3.1.3.).

Although we can identify these various stages at which an impact can be made, data limitations mean that it is only at the Behavioural (Firm-level) that the final impact can be measured via the primary and secondary behavioural variables. These represent the cumulative effect of the differing destination and behaviour of foreign affiliates. Although an attempt is made in Chapter 4 to analyse the data available to support the contention the Economy and Industry level effects of D.F.I. presence do exist, such material is necessarily of a circumstancial nature, pointing to the simultaneous presence of certain structural characteristics and above average involvement by foreign affiliates.

7.3. The Changing Structure of the E.I..

Chapter 2 demonstrated that the E.I. is one of the most rapidly expanding and successful industries of the U.K., and that the history of its development suggested that some change in the industrial structure had taken place. The E.I. had expanded net output faster than any other sector between 1955-76, with a movement away from heavy electrical engineering and towards electronics and instrument engineering, the growth sectors of the industry. The industry had become more capital intensive whilst the level of sales concentration in the minimum-list-headings had increased, leading to greater dominance by the larger companies. The level of employment and number of establishments had grown whilst in most other industries the figures had declined during the late 1960's and early 1970's. The E.I. compared favourably with the global industry, but remained well behind the leading three developed nations, i.e. the U.S., West Germany and Japan, in terms of their share of world trade. Examining the leading companies of the industry showed a continual process of rationalisation of product mix with widely varying company histories and the important role of merger activity as a provider of expansion strategy.

In Chapter 3 the model and its primary behavioural variables were applied to the E.I. and the resulting analysis confirmed that the industry's structure had changed significantly since the inter-war years, and that the rate of change had accelerated markedly since the middle 1960's.

The industry has expanded its level of productive capacity consistently above the average for all manufacturing sectors of the U.K. economy, increasing its share of sales turnover from 3.5% of all industrial sales in 1935,to 10.91% by 1974. This trend shows a marked acceleration in the last fifteen years, during which time the E.I. expanded value added faster than any other industry. The average company size and the level of labour productivity within these companies has also risen faster than in the remainder of the U.K. industrial sector.

During this time there has also been a trend for the disproportionate expansion of the larger companies of the E.I., with a resulting increase in the concentration of net asset worth. The tendency has also been for an acceleration of the speed with which the larger firms are dominating both the purchasing of inputs, and the sale of output of the E.I. (see Section 3.2.2.). Company merger/takeover is the most popular vehicle for industry rationalisation, and the increased level of such activity has added a dynamic quality to the mobility of firms within the industry. The highest percentage of mergers having taken place between companies both operating largely within the E.I., which facilitates the increased concentration of market power.

The industry has become more vertically integrated with the index of integration rising almost three-fold between 1954 and 1976. This increased level of interdependence is combined with a greater product specialisation by the individual operating affiliates. Multinational companies

are becoming more diversified but only by the addition of many smaller, more specialised affiliated companies to their organisation.

These higher levels of vertical integration and specialisation are reflected in the entry barriers facing the potential entrant. Greater economies of scale are being exploited by existing operators than was the case previously and this is true across the individual minimum-list-headings of the E.I.. The potential entrant now-also faces higher levels of overheads, especially in the field of R&D expenditures. Research and development costs are much higher in the E.I. than the other industries of the U.K. with 5.88% of sales revenue being directed towards such costs (the U.K. industrial average is only 1.44%), a figure which has grown from 3.39% in 1962 (0.60% for all industry). The increasing efficiency of firms in the E.I. and the need for large scale production techniques, discourages would-be entrants other than those with the necessary expertise or large scale capital available. This would help account for the lack of diversification in the E.I.'s companies as it becomes more difficult for non-electrical engineers to diversify into the E.I. from their own industry, and curtails the ability of firms to engage in cross-sector mergers between the various, more specialised, sectors of the E.I. itself, except for the largest companies.

The E.I. has, therefore, developed into a much tighter, cohesive unit, expanding at a faster rate than most other sectors of the economy. Concentration has increased in the majority of the sub-headings of the industry and companies

have become more integrated both up- and down-stream. The smaller companies still survive but either by an involvement in highly specialised areas of production, or by providing technical services for their larger counterparts. The tendency is not, therefore, for firms to expand organically into diverse activities, but for the larger groups to be more mechanically constructed chains of smaller, more specialised companies, obtaining the benefits of diversification via the varying specialisms involved.

Therefore, using the model as laid out above, industrial structure has changed significantly on all fronts. Its growth has been remarkable using any usual yardstick of activity as a contribution to the U.K. economy. Meanwhile average firm size has increased with an accelerated development of the dominance of the larger firms. The product and process structure has undergone modification whilst the ability to protect the market from potential entrants has increased both in terms of economies of scale and the cost of production. The level of merger activity has increased over the last decade or so, and this has contributed greatly to the changing structure of the E.I..

7.4. Destination Impact of D.F.I. upon Structure.

Chapter 4 demonstrated the evidence which suggested that an Economy-effect and an Industry-effect of foreign affiliate activity could exist.

The E.I. attracts the largest share of D.F.I. in relation to the percentage of U.K. production it contributes

to the economy. This share has also grown faster than any other industry (6.7% of all D.F.I. was attracted to the E.I. in 1960, compared with 11.7% by 1976). The single most important source of investment was the U.S. with over 72% of D.F.I. in the E.I. in 1976 (E.F.T.A. countries 6% and E.E.C. countries almost 21%), however the characteristics of foreign activity varied with geographical origin. As could be expected in a high technology industry such as the E.I. virtually all foreign affiliates originated from the developed nations of the above economic blocks, but E.E.C. based parents are more than proportionately attracted to the E.I. in above average numbers, (by 1976 20.8% of all D.F.I. in the industry originated from the E.E.C., whilst the figure for the whole of U.K. industry stood at only 15%, although this is a declining gap).

The distribution of affiliate activity throughout the economy suggests that foreign investors are attracted to industries which are experiencing the fastest expansion and displaying the greatest potential for future growth. As foreign investors are interested in above average proportions, and that such firms also have a tendency to outperform their indigenous competitors once present, there is every reason to believe that they make an above average contribution to the successful development of the industry (see Section 4.1.3.), and that resources, including public grants and incentives, will be attracted to the E.I. in above average proportions. This suggests the presence of Economy level pressures for a rationalisation of the industry's structure, but there would appear to be even clearer

evidence for a case for the existence of Industry level pressures, due to the differential distribution of affiliate activity throughout the minimum-list-headings of the E.I..

Evidence was presented to show that the affiliates of foreign parents do not operate in the sub-headings of the E.I. in the same pattern as indigenous firms. Indeed, some variation even exists within the foreign group itself. U.S. based parents prefer to participate in the production and sale of Scientific and Industrial Instruments and Systems, Radio and Electrical Components, Miscellaneous Electrical Goods, and Electrical Machinery, whilst E.E.C. based parents invest most readily in Radio and Electronic Components, and parents of Other country origin are mainly attracted to Scientific Instruments and Systems, Surgical Instruments and Appliances, and Electrical Machinery.

In general, however, foreign participation is most marked in areas of high concentration of market power, and increasing levels of concentration are often attended by greater levels of foreign dominance. Chapter 4 also demonstrated that higher levels of D.F.I. are also witnessed in those sectors displaying the highest levels of entry barriers, fastest growth of productive capacity and the greatest degree of vertical integration and product specialisation. It would appear valid, therefore, to assume that foreign affiliates are attracted to areas of the E.I. in a pattern which varies from the distribution of U.K. companies, and that the level of interest seems most significant in those areas which hold the greatest contribution to a changing

structure.

7.5. The Behavioural Impact of D.F.I..

Two chapters presented the results of the survey covering the impact of D.F.I. at a Firm-level (i.e. eminating from the differential operating behaviour of individual companies) influencing the primary (Chapter 5) and secondary behavioural variables (Chapter 6).

In Chapter 5 the analysis demonstrated that the average company size and the labour productivity of companies in the E.I. had risen faster than the remainder of the industrial sectors. Foreign affiliates operating in the E.I. maintain, on average, larger establishments in all minimum-list-headings than their British counterparts, and exhibit a higher level of labour productivity despite the tendency to pay wage rates above the national average for the industry. These affiliates are not significantly attracted to areas of above average establishment size but are found in significant numbers in sectors where the most rapidly growing companies are to be found. Whilst the overall number of establishments in both the E.I. and other industries of the U.K. economy has begun to fall since 1970, the number of foreign owned establishments, plants under their control, and the overall level of D.F.I. have continued to rise.
It can be concluded that a disproportionately high contribution to the increasing level of productive capacity in the industry originates from the operations of the foreign

affiliates within it. (See Section 5.2.). These affiliates are in general larger than their British counterparts; located in those sectors of the industry displaying the greatest growth ratings; are less likely to withdraw in harsh economic times; show a greater labour productivity; and experience a higher rate of return than indigenous companies.

The concentration of market power into the hands of the E.I.'s largest companies, and their increasing dominance over both the factor inputs and outputs of production is more pronounced in the foreign sector. These affiliates operate in conditions of greater market imperfection, with a greater concentration of market power in the hands of the larger companies. This is probably only to be expected given the widespread intervention of the foreign conglomerate into the U.K. industry, which evidence suggests, plays a significant role in the rationalisation of the most merger active industry of the U.K. economy. Such affiliates have aided, in no small way, the trend for increasing concentration and imperfection of competition in the E.I..

The foreign affiliate appears in the U.K. market in a truncated form, and displays a greater interdependence within its corporate group as demonstrated by higher levels of vertical integration and a lower degree of individual establishment diversification (greater product specialisation) than their U.K. counterparts. Intra- company trade is much greater in the foreign owned conglomerate, with affiliates of E.E.C. based parents showing the greatest interdependence.

Greater exploitation of economies of scale (see Table

5.10.), higher R&D expenditures (4.72% of sales turnover is designated to R&D expenditure in the average foreign affiliate as compared with 3.05% in the U.K. firm), higher wage payments (see Table 5.3.), and the importance of merger activity as a growth medium (see section 5.3.), will have a tendency to increase the entry barriers facing potential entrants, as does the increasing market imperfection which the presence of foreign affiliates seems to enhance. In each case the contribution to the height of individual barriers by foreign affiliates is greater, on average, than that of a comparable British company.

The foreign sector is not homogeneous however, and the differing ownerships reveal differing operating characteristics.

7.5.1. The U.S. Owned Companies.

Companies under U.S. ownership and control comprise the largest and most merger active of the foreign group operating within the E.I.. The individual companies are, on average, not as large, or as productive as those of E.E.C. origin, but this may be due in part to their payment of higher wage levels.

The U.S. affiliates are less likely to operate under conditions of oligopolistic competition than their foreign collegues, and the larger U.S. companies are not as dominant in their control of labour input as the non-E.E.C. (Other) companies, although this is greater than in the E.E.C. owned firms.

The product and process structure of the U.S. affiliates varies from the remainder of the foreign firms being less vertically integrated and diversified, with these companies displaying a lesser degree of interdependence but greater specialisation within the individual product mixes. This is supported by the higher levels of R&D expenditure by U.S. affiliates, implying less parental help and greater technical specialisation. This also increases the level of entry barriers, as does the U.S. affiliate's greater exploitation of economies of scale, and the payment of higher wage rates.

Therefore the biggest contribution to the changing industrial structure of the E.I. from the presence of U.S. affiliates appears to stem from their specialist operations, increasing the level of specialisation within the industry, and their role in helping to increase the level of technical, overhead cost, and scale barriers to entry for potential newcomers to the E.I.. The dominance of this group within the flow of D.F.I. to the industry also means that they must be held most responsible for the growing addition to the level of productive capacity of the E.I. by foreign affiliates.

7.5.2. The E.E.C. Owned Companies.

This group of companies represent the second largest foreign stake in the E.I., and relative to their size, are the most merger active (although in absolute terms the U.S. firms must be considered to have the most impact upon the merger/takeover technique).

These affiliates are, on average, larger than any other foreign affiliate, display the highest levels of labour productivity and are growing faster in numbers and size than other sectors. They also have the second lowest sales concentration, with activity being spread evenly across the whole range of company sizes. However, because of two factors, namely, the low total number of such firms in the industry compared with the U.S. sector; and secondly because these companies are on average, much larger than the national average, this sector could still bring to bear a considerable oligopolistic pressure.

These companies are highly interdependent, with a high level of vertical integration, far greater than any other foreign ownership group. Meanwhile, the activities of the huge Philips conglomerate, especially through its affiliate, Pye, means that the index of diversification is higher than the two remaining sources of D.F.I..

The E.E.C. owned affiliates spend the smallest percentage of turnover upon R&D activities, possibly because of their high degree of involvement with standardised electronic consumer goods. They also provide the least evidence of exploiting economies of scale, which can be partially explained by the absence of a large range of company size, and the truncated nature of their operations which means that economies of repetition through assembly line operations can be more important. Also the larger size of most E.E.C. affiliate establishments means that economies are shared fairly evenly amongst all such affiliates, and as our measure shows the increasing scale economies relatively

between the larger and smaller groups, the lack of significant scale difference would undervalue the result for this sector.

In conclusion, therefore, the biggest pressures for structural change in the E.I. from the presence of E.E.C. affiliates stem from the high levels of productive capacity growth, and vertical integration, producing large, interdependent corporate structures.

7.5.3. Affiliates of Other Country Parents.

These affiliates comprise the smallest sector of the foreign companies present in the E.I.. They have the lowest contribution to productive capacity, with the slowest rate of growth of investment in net assets. Low productivity could be largely due to high wage payments, whilst the establishments are, on average, smaller than any other foreign affiliate. Their high level of concentration is exaggerated by the few companies operating compared with the other two sectors, but evidence suggests that the bulk of investment is in the hands of a few large parents. However, the relatively small size of even these larger investments, implies that the level of industrial concentration is not greatly influenced by such activities. What effect there is will probably, therefore, lead to an increase in the level of competition rather than a move towards an oligopolistic situation.

Average results for the level of vertical integration and diversification again suggests that such companies do no more than support the effects of the two larger groups.

The same is true for entry barriers, with a reinforcement of the results of the two earlier groups of foreign affiliates. In conclusion, this sector is having some effect upon the industrial structure of the E.I., but this is only a minor role because of the lack of real presence. However, the future growth of Japanese and Third World multinational investment is a distinct possibility, and therefore such differences in performance and behaviour is of importance for future policy decision taking.

Thus each group comprising the foreign sector displays its own characteristics and brings a different pressure to bear on the structure of the E.I.. This differing role is not confined to the foreign companies, however, the British group of firms is certainly not homogeneous either.

7.5.4. Independent British Companies.

The independent companies in the E.I. are much smaller, on average, than the affiliates of larger British companies and those of the foreign sector, and also have a much lower labour productivity than these firms. They can, however, compete on wage levels. The distribution of market power suggests that the labour input is concentrated in the hands of the larger companies, however, such companies increase rather than reduce the overall level of competition because of their relatively small market share. Also the sales concentration ratios for such companies was lower than any other sector than the figure for the small U.K. domestic corporate groups. These companies are reasonably diversified by industry standards and spend almost as much on R&D relative to their size, as the foreign sector. Their contribution

to the level of the E.I.'s entry barriers is minimal. There is no doubt, however, that the real impact on industrial structure originates from the larger combines, and that the independent enterprises in the E.I. are responders rather than instigators, but that such companies are not adversely affected by structural change, and can adapt to assume the characteristics of the structure within which they operate.

7.5.5. Small British Companies' Affiliates.

The affiliates of Britain's smaller corporate groupings manage to be last in all rankings of importance within the instigation of structural change, except that they exploit economies of scale to a greater extent than the independent U.K. manufacturer and display a greater product specialisation than any other group; but show an extremely low level of vertical integration. It would appear that even the small independent company often contributes more to the changing industrial structure than these affiliates of small organisations. Such firms have the lowest productivity, seeming to benefit neither from the economies of scale available to the larger British groups, nor the intimate working conditions of the small independent manufacturer. They also spend small amounts upon R&D with no evidence that they are more efficient in their use of such expenditures.

7.5.6. Affiliates of Large British Companies.

It has already been seen that the foreign affiliates seem to demonstrate their multinationality rather than

foreignness when competing with indigenous industry in the E.I.. It could be expected that the affiliates of large U.K. owned multinationals would have similar characteristics to the foreign company, therefore. This broadly tends to be the case, with one or two notable exceptions. It is also noticeable that at no point is the role of the average affiliate greater than that of the average foreign affiliate i.e. the foreign affiliate parallels the development of the E.I.'s structure far more closely than does the average U.K. firm. This implies that a growing number of foreign affiliates will have an increasingly cumulative effect upon the structure of the E.I., bending the degree of market competition towards their own operating principles and, if the theories of oligopolistic reaction are to be believed to any great extent, then towards a more imperfectly competitive situation with increasing dominance of the large foreign affiliate.

These affiliates are usually of an equal size to most foreign establishments, but do not experience the same labour productivity even though wage levels are usually lower. Also the concentration of market power is not as great as that of the foreign sector both abroad and in the U.K.. Probably this is only to be expected, with the large numbers of indigenous firms as compared with the relatively smaller numbers of foreign affiliates who will be expected to display some minimum operating size to overcome the disadvantages of servicing overseas markets by direct production facilities located abroad.

British affiliates are not as vertically integrated as the average foreign affiliate (although intra-company

trade is almost as high as in the U.S. sector) and tend to be more diversified in their product range. They spend less upon R&D and exploit economies of scale only as well as the lowest foreign group. Their role in the changing structure of the E.I. is more important than the other British sectors, because of their magnitude, but also in their individual establishment operations. This is a highly merger active sector, often in response to foreign competition.

Therefore, only the operations of the U.K. affiliates of large groups are compatible in their individual impact upon industrial structure with the average foreign affiliate. This means, therefore, that many of the above noted characteristics are symptomatic of their 'multinationality' rather than 'foreignness', but obviously the differing sources of investment do have some meaningful role to play in influencing the overall profile of individual structure.

Chapter 6 shows that the secondary behavioural variables are also significantly influenced by the presence of foreign affiliates. This and earlier material supports the view that foreign affiliates in the U.K. and the E.I. in particular, outperform their indigenous competition displaying increased productivity in all minimum-list-headings of the E.I.. (See Table 6.6..) This is due to greater efficiency based upon a higher rate of profitability on sales rather than increased sales turnover or greater levels of labour productivity and management capability. To some extent the findings of this study varied slightly from earlier results in that more emphasis is placed on the increased efficiency of foreign affiliates stemming from a greater labour product-

ivity and improved use of net assets to generate a speedier turnover of sales.

The E.E.C. owned companies proved to be the most efficient, particularly when measured via rate of return on assets employed with U.S. owned affiliates showing up best on profit margins (but nowhere near the U.K. figures). This increased efficiency held true for virtually all the minimum-list-headings of the industry. Within the British groups the affiliates of small domestic firms proved to be generally the most profitable but their results demonstrated a lack of productivity. This can be explained by their high profit margins per unit of sales as demonstrated in Table 6.4..

The regional location pattern of foreign companies differs from that of the U.K. firms within the E.I., and variations also occur within the foreign group itself. These companies are attracted to areas of economic potential, financial incentives and labour availability. E.E.C. owned affiliates are attracted to transport and communication links, whilst U.S. firms are more prepared to locate in depressed regions seeking cheaper factor inputs, financial incentives, but are also evident around the larger commercial centres.

The U.K. government has helped sponsor an aggressive domestic reaction through bodies such as the I.R.C. and the N.E.B., with industry rationalisation via large scale merger activity. It would seem naive to believe that much of the significant change in the profile of the E.I. would not have occurred without the presence of foreign affiliates, however, there is enough evidence to suggest that their presence

both directly and indirectly imposes a major influence upon the industrial structure of the E.I..

Thus we are now in a position to suggest that the hypotheses presented in Chapter 3 have not been disproved, and that D.F.I. has a significant role to play in the changing structure of the E.I., and that these findings have some general relevance to the understanding of the impact of foreign affiliates upon industrial structure. Although this study has concentrated upon a single industry, its position within the economy makes the findings of some importance, and individual evidence of previous writers suggests that the results are not atypical of the other industries of the U.K..

The relationships identified between the variables of the model and the role of D.F.I. were determined by empirical testing and a study of the work of earlier writers. In both cases the data base consists of all the industrial sectors of the U.K. economy, implying that such relationships exist throughout the economy. During the study, at no time have assumptions been made that would appear to hold only for the E.I. and not for all other industries. The study also suggests that many characteristics occur because of their 'multinationality' and are modified by the 'foreignness' of foreign affiliates. This should be equally true of other industrial sectors. We would suggest that the destination and behavioural effects of affiliate activity will vary from industry to industry and will be influenced by the domestic reaction, which will also vary. However, the

question is one of degree and not a question as to whether such effects will occur at all. This of course requires empirical testing, and hopefully some further research will be initiated on a comparative industry basis. It seems not unreasonable to assume, however, that the business ethic of foreign companies has not been significantly different from industry to industry and that operating characteristics are, therefore, similar across the economy of a host country.

There are changes occuring in the E.I., however, which will have a shorter lead time than in other industries, simply because of the high technology nature of both the changes and the industry in question. For example, the rapid approach of the widespread development and use of microprocessing, micro-chip technology, nuclear energy, audio-visual and office equipment; computer hardware and peripherals, aerospace and electrical consumer goods. Such areas all display tremendous potential for development and expansion in the next decade, and this will have a major impact upon other sectors of industry, but as such technology is basically one of electronics and instrumentation, it is in the E.I. that the initial impact will be felt.

The development of such technology attracts the interest and R&D effort of new companies, and in doing do places great pressure upon the existing structure of the industry. It is useful to identify some of the changes which are expected to occur in the near future, and using the findings of this study, attempt to predict what structural changes are likely to occur.

7.6. Future Technology, D.F.I., and Structural Change in the E.I..

The rapid development of the E.I. has slackened somewhat during the 1970's with productive capacity growing at less than 3.5% per year, declining profitability (averaging 10% rate of return on sales), lower levels of productivity (ranging between £10,000 and £13,000 sales per employee in the minimum-list-headings of the E.I.) compared with other major producers (e.g. West Germany £20,000-£40,000 sales per employee, France £20,000 to £50,000, Italy £12,000 to £20,000, Sweden £20,000 to £30,000, and the U.S. £15,000 to £50,000), the lowest levels of capital employed per employee of any major electronics producing country (£3,000 to £6,000 capital per employee), falling employment (340,000 at present and forecasts of less than 330,000 by 1985), and low levels of R&D budgets (0.5% of annual revenue compared with 5-18% in U.S., Europe and Japan).

This has been reflected in the falling rates of return accruing to the industry and the declining interest in the E.I. by foreign investors witnessed in Chapter 4. However, the evidence suggests that this situation is about to be reversed and that the revival of the Electronics sector will help the industry recover some of its direction.

Several regions of the U.K. are making an effort to attract more foreign investment. e.g. The Scottish Development Agency intends to stimulate Scottish businessmen directly, but also to encourage foreign investors, especially

those of U.S. origin, to locate in the region. They intend to adopt the successful model of the Irish Development Agency, and a team has recently made a promotional tour of the U.S.. Meanwhile the Welsh Development Agency has recently praised the activities of Sony in Bridgend.

The latest report of the consumer working party on electronics suggests that the active involvement of Japanese manufacturers should be sought by encouraging inward investment. The object would be to promote the rationalisation of the U.K. television set industry into units of the scale necessary to introduce low-cost automated assembly and to incorporate the latest Japanese product and process technology. This would also have the effect of strengthening the vertically integrative synergy of T.V. component manufacture, and allow for some diversification into visual display units. However, the dangers of product development still taking place outside the U.K. even with such overseas involvement should be stressed, and the government must still be prepared to provide some central financial provision for the industry's investment and R&D programmes. The working party suggests that this central direction should not become too rigid or over committed to grandiose industry-wide plans which rely on too substantial a degree of government subsidy. Thus direct government intervention would be kept to a minimum, and the rationalisation of the 1980's, unlike that of the 1960's would be market rather than centrally initiated, of which G.E.C./Hitachi, Sanyo/Thorn, Toshiba/Rank are early examples of cooperation.

The uncertain future of the NEB leads to speculation over the future restructuring of the computer industry. Under the previous government plans were being laid for the centralisation of government intervention into the structure of this industry via the NEB.. The previous intervention such as the abortive attempt to link the minicomputer activities of Ferranti, Computer Technology (CTL) and possibly G.E.C., has been a piecemeal approach. The basic strategy involves the establishment of a new subsidiary, INSAC Data Systems, which would become the focus for the development of software expertise and would entice companies towards the hitherto daunting overseas markets like the U.S. and Japan. Capital would be provided for development of this sector, which has consistently outperformed the U.K. hardware sector and an area which contributes over 70% of the cost of computer installation (as hardware prices fall this percentage will rise). Meanwhile the Technical and Supervisory Section (TASS) of the Amalgamated Union of Engineering Workers have reported the need for rationalisation of the hardware producers and the introduction of a single British Computer Corporation. This policy would also include selective import controls and public sector purchasing of U.K. produced equipment. (A policy supported by recent E.E.C. recommendations in the face of intense U.S. and Japanese competition). Meanwhile Japanese electronics companies have been quick to see the advantages in the establishment of overseas production plants in the face of problems posed to exports by such protectionism, the rising value of the

Yen, the energy crisis, and rising domestic wage costs.

Rationalisation of the heavy electrical machinery industry, in particular in the field of power generating machinery has been muted. The previous government's Think Tank have suggested the merger of Babcock and Wilcox with Clarke Chapman, and a similar link between C.A. Parsons and G.E.C.'s power subsidiaries to reduce the overcapacity in the industry.

The NEB has already undertaken prolonged negotiations with G.E.C., S.T.C., and Plessey with the object of reducing the number of telecommunications manufacturers from three to two. The strategies include the nationalisation of this sector (Opposed by all three companies, the post office who would face a monopoly supplier, and unlikely under the new government), a joint marketing operation (which leads to problems of coordination and control), and a merger between the two weaker companies,Plessey's and S.T.C.'s subsidiaries (opposed by I.T.T. if there is any suggestion of Plessey taking control). Obviously all of these alternatives would lead to a significant change in the structure of the sector.

This suggests that both domestic and overseas pressures are building up for future changes in the industrial structure of the E.I.. The direct stimulation of foreign investment and the attraction of manufacturers to a revived and successful U.K. industry would lead to greater foreign involvement in the 1980's, Our model suggests that this will have implications for the way in which the industry will develop.

The upheaval could be comparable with the takeover struggles of the late 1960's, starting as soon as the summer of 1979. Some companies such as Plessey, Decca, Ferranti and E.M.I. have failed to show the growth, the profit and the investment necessary to assure them of a place amongst their major rivals in the U.K., U.S., Japan and Germany. Meanwhile the likes of G.E.C., Thorn and in particular Racal have maintained high levels of expansion and performance. Several leading analysts and stock brokers such as Buckmaster and Moore, Vickers da Costa, and James Capel believe that these three companies will be the most important U.K. companies of the 1980's.

Market pressures for rationalisation have been building up together with the personal and corporate ambitions of some of the U.K. and foreign investors. One relatively small move could release the tension in a domino effect. There is a growing feeling that many areas of the industry, in particular electronics, are too fragmented and that rationalisation is needed to improve general performance and to make better use of skilled manpower and other limited resources.

Firms such as Racal could simply be waiting for a movement such as the sale of Plessey's telecommunications subsidiaries to feel that the smaller company which resulted could be swallowed up by the aggressive preditor. Both Racal and G.E.C. have expressed an interest in Ferranti, however the Monopolies Commission may well intervene here, and Ferranti could find itself part of the proposed NEB subsidiary. Another company which would fit in well with either G.E.C. or Racal is Decca, whilst

Thorn may well have ambitions in this direction as well.

E.M.I. shares the problem of several smaller companies. It has excellent engineering skills and good contracts with the Ministry of Defence, but is really too small to compete with the international giants. The rise and fall of its X-ray scanner illustrates the point, failing in the face of competition in the U.S., Japan, and Germany.

The case for further rationalisation with all its attendant risks and disturbance is that if Britain is to increase exports of electrical goods, every penny of R&D must be made to count. Research must also be coordinated with an overall marketing strategy. The smaller companies represent . R&D expenditures of over £100 million which is at present fragmented. There is also overcapacity in some areas, and an inability to fully exploit economies of large scale assembly production in others.

The impressive performance of large national groupings in Europe shows the advantages of such an arrangement. Siemens of Germany and Thomson CSF in France are both outstanding examples. In both countries the concentration of power has been more or less helped by government policy and public purchasing decisions. Some synergy of related technologies is also present, telecommunications and computers is such an example. Add to this the chronic shortage of electronic and computer technicians in Britain and the case for a potential rationalisation becomes very strong, given sound management decision taking.

Rationalisation of the industry involves foreign investors either as direct participants or as initiators of a domestic reaction. The weaker companies could well be snapped up by the likes of Philips or I.T.T..

Resources will be attracted to the E.I., and in particular the minimum-list-headings which comprise the Electronics sector. Thus a Destination effect will be initiated. The involvement of more Japanese and E.E.C. investors will lead to greater concentration of market power, with larger units of production and greater exploitation of vertical integration and economies of scale. This will be reinforced by the development of the micro-electronics industry. The capital expenditure necessary to produce firstly the microprocessors, and secondly the next generation of microprocessor production equipment, means that smaller companies may experience financial difficulties through lagging behind in technical developments and investment. The fears of high unemployment may lead to problems with industrial relations, however the producer industries should not experience the same difficulties as the user industries. Once accepted, the micro-chip revolution could mean significant changes in the product and process structure as more computer controlled production systems are developed and new products introduced.

The capital intensiveness of the industry will increase, becoming more technologically specialised, with the resulting increase in entry barriers. Productivity should increase and therefore so should productive capacity. The efficiency of production and the resource conversion process should be improved but sales will be concentrated in the hands of fewer,

larger companies exploiting economies of scale and investing in high levels of R&D expenditure.

7.7. Implications for Future Research.

In the field of international investment, there is a need for much more readily available, and clearer data. Official sources of such material are few and far between, academic and government institutions often rely upon mass media coverage or limited survey material. This will always tend to be the case as long as the financial reporting requirements by foreign affiliates are as weak as they are at present. In the meantime there is a need for greater amounts of empirical data by dedicated researchers in this field. Certainly greater study is needed of merger activity involving foreign parents, and the whole question of whether the characteristics attributable to an expression of the business ethic of overseas investors is one of their 'multinationality' or their 'foreignness'.

Future researchers may wish to extend their approach to a comparative industry study which could prove a useful vehicle for examining the impact of foreign penetration upon differing industrial structures. This also might be carried out on a cross-national basis in an attempt to identify whether or not the experience of host economies differs.

There is also a need to extend the coverage of this study in several directions. Firstly, the influence of all forms of overseas market servicing might be examined, i.e.

exports + licensing + D.F.I.. Linkages may exist between these which will influence the structure of the host economy. Secondly, the Economy and Industry level effects of D.F.I. upon structure could also be examined further, preferably on a longitudinal basis. This destination impact of foreign affiliates and their influence upon the resource allocation process within the host economy, is an important factor but an extremely complex one, involving a host of alternative position assumptions with regard differing dispositions of investment. Finally cost/benefit analysis of these findings and their implications for government policy could be usefully examined. For example, should a policy towards foreign investment differentiate between different sources of that investment, or to what extent will the impact of Japanese multinationals (when fully developed) differ from those already widely operating in the U.K. economy.

The concentration of earlier writers upon the operations of U.S. investors seems to be partially justified, given the findings of this study and the overwhelming influence of such affiliates. However, the possible future development of Third World countries, the Far and Middle East, and in particular, Japan, means that further research must be prepared to identify between source countries more than has been the case in the past, and could do worse than to try and identify the destination and behavioural effects of any such investment in the U.K.. The sweeping developments presently taking place in the E.I., particularly in Electronics, make this industry a natural target for further foreign investment and rationalisation, and continuing data collection and collation is necessary.

APPENDIX.

APPENDIX A.

Authors Represented in Fig. 1.1.*

Relationship (Numbered Arrow)	Authors**
1.	Mann (1973), Bain (1956).
2.	Scherer (1970), Bain (1956), Caves (1974).
3.	Haldi and Whitcomb (1973), Baumol (1967).
4.	Stein (1973), Scaperlanda and Mauer (1969), Buckley and Dunning (1976).
5.	Guth (1973), Schwartzman (1973).
6.	Guth (1973).
7.	Phlips (1971), Stigler (1963), Telser (1964), Bain (1959).
8.	Machlup and Taber (1973), Berry (1973).
9.	Penrose (1959), Hanson (1953).
10.	Weiss (1973), Utton and Hart (1973).
11.	Phlips (1971), Steuer (1973), Scherer (1970), Horst (1972), Stubenitsky (1970).
12.	Knickerbocker (1973), Rosenbluth (1970).
13,14,15.	Scherer (1970).
16,17.	Penrose (1959), Weston (1973).
18.	Comonor and Wilson (1973 & 1965)

*This is by no means an exhaustive list, but simply representative of the many works covering the plotted relationships.

**See bibliography for the full references.

APPENDIX B.

List of Product Groups as Defined in Terms of the Standard Industrial Classification.

Description		Minimum List Heading.
MINING AND QUARRYING PRODUCTS	100	
Coal		101
Extraction of petroleum and natural gas		104
Other mining and quarrying products		102,103, 109.
FOOD	210	
Grain milling products(including meal and flour and breakfast cereals) and animal and poultry foods and feeding stuffs		211,219
Bread,flour confectionary and biscuits		212,213
Bacon,meat and fish products		214
Sugar		216
Cocoa,chocolate and sugar confectionary		217
Fruit and vegetable products(including jam,canned and bottled vegetables and fruit and soups)		218
All other food products (including margarine,heat treated milk and milk products,proprietary food drinks, tea, coffee, self raising flour etc.)		215,229
DRINK AND TOBACCO	230	
Beer and malt		231
Spirits		239/1
Soft drinks, British wines, cider and perry		232,239/2
Cigarettes,cigars and tobacco etc.		240
COAL AND PETROLEUM PRODUCTS	260	
Hard coke and manufactured fuel etc.		261

Appendix B cont...

Description	Minimum List Heading.
Petroleum products (including lubricating oils prepared at refineries)	262
Lubricating oils and greases (other than those prepared at refineries)	263
CHEMICALS AND ALLIED PRODUCTS	270
Pharmaceutical chemicals and preparations	272
Toilet preparations and perfumery	273
Paint	274
Soap and detergents	275
Synthetic resins,plastics materials and synthetic rubber	276
Polishes,formulated adhesives,gelatine etc.	279/1, 279/2
Other chemicals (including dyestuffs and pigments, fertilizers, explosives, and fireworks, matches, formulated pesticides etc., printing ink, surgical bandages etc., and photographic chemical materials including sensitized photographic film and plate)	271/1,271/2,271/3 277, 278, 279/3, 279/4, 279/5, 279/6, 279/7.
METAL MANUFACTURE	310
Iron and steel	311,312,313
Aluminium	321
Copper,brass and other basic metals	322, 323
MECHANICAL ENGINEERING GOODS	330
Agricultural machinery (except tractors)	331
Metal-working machine tools	332
Pumps,valves,compressors and fluid power equipment	333
Industrial and marine engines	334
Textile machinery and accessories	335

Appendix B cont...

Description		Minimum List Heading.
Construction and Earth moving equipment		336
Mechanical handling equipment including powered industrial trucks and industrial tractors		337
Office machinery		338
Industrial (including process) plant, constructional steelwork and other fabricated iron and steelwork		341
Other non-electrical machinery		339
Other mechanical engineering		342,349
INSTRUMENT ENGINEERING	350	
Photographic and document copying equipment		351
Watches and clocks		352
Surgical instruments and appliances		353
Scientific and industrial instruments and control systems (including computers and peripheral equipment not separable from industrial control systems)		354
ELECTRICAL ENGINEERING GOODS	360	
Electrical Machinery		361
Insulated wires and cables		362
Telephonic and telegraphic apparatus, and equipment including telecommunication links.		363
Radio and electronic components		364
Broadcast receiving and sound reproducing equipment		365
Electronic computers, other than computers and peripheral equipment not separable from industrial control systems and telecommunication links		366
Radio, radar and electronic capital goods		367
Electric appliances primarily for domestic use, including domestic refrigerators		368

Appendix B cont...

Description		Minimum List Heading.
Miscellaneous electrical goods		369
SHIPBUILDING AND MARINE ENGINEERING	370	
Shipbuilding and ship repairing		370/1
Marine engineering		370/2
VEHICLES	380	
Motor vehicles (including tractors other than crawler or industrial types) including parts and accessories except electrical equipment		380,381
Motor cycles,tricycles and pedal cycles		382
Aero-engines (manufacture and repair)		383/2
Airframes (manufacture and repair)		383/1
Air cushion vehicles (manufacture and repair)		383/3
Aerospace equipment - parts and accessories		383/4
Locomotives,railway carriages, wagons etc.		384,385
METAL GOODS NOT ELSEWHERE SPECIFIED	390	
Engineers' small tools and guages		390
Cans and metal boxes		395
Hand tools and implements, cutlery and plated tableware, bolts, nuts, screws, rivets, etc., wire manufacturers, jewellery and precious metals and other metal products not elsewhere specified		391,392,393, 394,396,399.
TEXTILES	410	
Man-made fibres (staple fibre and continuous filament yarn)		411
Yarn and thread of cotton, flax and man-made fibres		412
Cloth and piece goods of cotton, linen, silk, and man-made fibre		413

Appendix B cont...

Description	Minimum List Heading
Wollen and worsted products	414
Hosiery and other knitted goods	417
Carpets	419
Textile finishing	423
Other textile manufacturers including asbestos products (except asbestos cement)	415,416,418, 421,422,429.
LEATHER, LEATHER GOODS AND FUR	430
Leather, undressed and dressed, and manufacturers of leather and fur	431,432,433
CLOTHING AND FOOTWEAR	440
Men's and boy's tailored outwear	442
Women's and girl's tailored outwear	443
Dresses, lingerie (excluding corsetry), infants wear etc.	445
Other clothing, including weatherproof outerwear, overalls, men's underwear, corsetry, gloves, hats, etc	441,444,446, 449.
Footwear	450
BRICKS, POTTERY, GLASS, CEMENT, ETC.	460
Bricks, fireclay and refractory goods	461
Pottery and china	462
Glass (including glass fibre but excluding manfactures thereof)	463
Cement	464
Other building materials and abrasives	469
TIMBER, FURNITURE, ETC.	470
Furniture,upholstery,bedding and soft furnishings	472,473

Appendix B cont...

Description	Minimum List Heading.
Timber and miscellaneous wood manufactures	471,474,475, 479.
PAPER, PRINTING AND PUBLISHING	480
Paper and board	481
Manufacturers of paper and board	482,483,484
Newspapers,periodicals and other printed and published matter	485,486,489
OTHER MANUFACTURES	490
Rubber manufactures (including tyres and tubes)	491
Linoleum,plastics floor-covering, leathercloth, etc., and plastics moulding and fabricating of articles not elsewhere specified	492,496
Other manufactures including brooms, toys, games, children's carriages and sports equipment and stationer's goods	493,494,495, 499.
CONSTRUCTION	500
Building and civil engineering work of all kinds	500
GAS, ELECTRICITY AND WATER	600
Gas and gas by-products	601
Electricity	602
Water	603

Source: Department of Trade and Industry - Report on the Census of Production 1968, H.M.S.O.

APPENDIX C.

Sample Questionnaire.

UNIVERSITY OF BRADFORD MANAGEMENT CENTRE

QUESTIONNAIRE

1. Would you please fill in the approximate figures relevant to your own company for the accounting year ending in 1974 (at closest to December 31 1974)

(a) Total Sales (£'s sterling)

(b) The percentage of these sales in ..... *

(c) Total Wage Bill (Wages and Salaries)

(d) Total Workforce (Whole-time equivalents including salaried staff)

(e) Net Asset Worth (Total Assets - Current Liabilities)

(f) Net Profit (After depreciation but before tax)

(g) Total Purchases (£'s sterling)

(h) What percentage of these purchases were from companies under the same ownership as yourself? (if you are a parent company please count purchases from subsidiaries)

(i) Expenditure on Research and Development (If R. & D. is centralised, please estimate the value of services you received. If this is not possible please use the space below to explain)

2. In your opinion has the emergence of the conglomerate company in the Electronics and Instrument Engineering Industry had any effect upon your company, or the industry as a whole?

Please feel free to comment.

'Greatly

Minimally

No Effect

*For each enquiry the firm's major product line was filled in.

Glossary of Abbreviations Utilised in the Bibliography.

A.E.R.	- American Economic Review.
A.N.U.P.	- Australian National University Press.
B.I.M.	- British Institute of Management.
B.O.U.I.S.	- Bulletin of the Oxford University Institute of Statistics.
B.R.	- Business Ratios.
C.J.E.P.S.	- Canadian Journal of Economics and Political Science.
C.U.P.	- Cambridge University Press.
E.J.	- Economic Journal.
E.R.	- Economic Record.
H.U.P.	- Harvard University Press.
J.A.E.	- Journal of Applied Economics.
J.B.F.A.	- Journal of Business Finance and Accounting.
J.I.B.S.	- Journal of International Business Studies.
J.I.E.	- Journal of Industrial Economics.
J.P.E.	- Journal of Political Economy.
J.R.S.S.	- Journal of the Royal Statistical Society.
L.B.R.	- Lloyds Bank Review.
M.I.T.	- Massachusetts Institute of Technology Press.
N.I.E.S.R.	- National Institute of Economic and Social Research.
N.I.E.R.	- National Institute Economic Review.
O.E.P.	- Oxford Economic Papers.
Q.J.E.	- Quarterly Journal of Economics.
R.E.S.	- Review of Economics and Statistics.
S.J.P.E.	- Scottish Journal of Political Economy.
S.L.R.	- Stanford Law Review.
U.R.D.E.D.P.	- University of Reading Department of Economics Discussion Paper.
Y.U.P.	- Yale University Press.

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